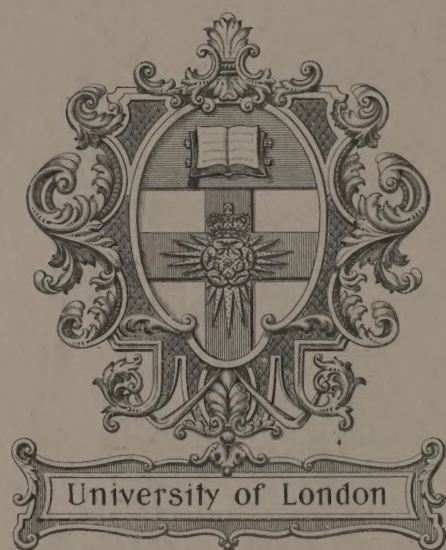
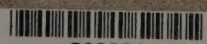






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ACCOUNTS AND PAPERS:

SIXTY-THREE VOLUMES.

— (23.) —

MISCELLANEOUS—(*continued*).

Session

31 *January* 1893—5 *March* 1894

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1893-94.

ACCOUNTS AND PAPERS:

1893-94.

SIXTY-THREE VOLUMES:—CONTENTS OF THE

TWENTY-THIRD VOLUME.

N.B.—*THE* Figures at the beginning of the line, correspond with the N^o at the foot of each Paper; and the Figures at the end of the line, refer to the MS. Paging of the Volumes arranged for The House of Commons.

MISCELLANEOUS—continued.

Board of Agriculture (Distribution of Grants) :

- [c. 7137.] Report on the Distribution of Grants for Agricultural Education in Great Britain in the Financial Year 1892-93, with an Appendix. p. 1

Experiments on Living Animals:

203. Return showing the Number of Experiments performed on Living Animals during the Year 1892, under Licenses granted under the Act 39 & 40 Vict. c. 77, distinguishing Painless from Painful Experiments (in continuation of No. 218, of 1892). 163

Hall-Marking (Gold and Silver Plate) :

456. Return of the Charges made from the Assay and Marking of Gold and Silver Wares by the Hall-Marking Authorities in the undermentioned Places, with respect to Plate manufactured in the United Kingdom and to that imported from Abroad, and the Statutory Authorities for making such Charges: London, Birmingham, Sheffield, Chester, Edinburgh, Glasgow, and Dublin. 199

Identification of Habitual Criminals:

- [c. 7263.] Report of a Committee appointed by the Secretary of State to inquire into the best means available for Identifying Habitual Criminals; with Minutes of Evidence and Appendices. 209

Immigration into the United States :

96. Communication addressed to Mr. John Burnett and Mr. David Schloss, directing them to inquire into and report on matters connected with the Immigration of Foreigners into the United States. 293

Licenses (Woods and Forests Department) :

156. Return showing the Number of Licensed Houses Leased by the Department of Woods and Forests during the Ten Years ending the 31st day of March 1892; the Terms on which the Leases have been Granted; and, in cases of Renewals, the Terms on which the Premises were previously held. 295

Millbank Prison :

419. Report of the Surveyor on the Demolition of Millbank Prison by the Unemployed. 301

Ordnance Survey:

- [c. 6895.] Report of the Departmental Committee appointed by the Board of Agriculture to inquire into the present Condition of the Ordnance Survey, with Copy of the Minute appointing the Committee. p. 305
- [c. 6895-I.] Minutes of Evidence, Appendices, and Index. 347
- [c. 7257.] Minute of the Board of Agriculture, dated the 22nd December 1893, upon the Report of the Departmental Committee appointed to inquire into the present Condition of the Ordnance Survey. 633
- [c. 7001.] Report of the Progress of the Ordnance Survey to the 31st December 1892. 649
-

BOARD OF AGRICULTURE.

REPORT

ON THE

Distribution of Grants for Agricultural Education in Great Britain

IN THE

FINANCIAL YEAR

1892—93

WITH AN APPENDIX.

Presented to both Houses of Parliament by Command of Her Majesty.



LONDON:

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1893.

[C.—7137.]

CONTENTS.

REPORT	Page
LIST OF GRANTS AWARDED—1892-93	iii
APPENDIX :	x
I. Epitome of Reports on certain of the Institutions receiving grants :	
(1.) University College of North Wales, Bangor	1
(2.) Yorkshire College, Leeds	6
(3.) Durham College of Science, Newcastle-upon-Tyne	15
(4.) University College of Wales, Aberystwyth	23
(5.) Cambridge and Counties Agricultural Education Committee	27
(6.) Bath and West of England Society	30
(7.) Eastern Counties Dairy Institute	31
(8.) British Dairy Farmers' Association	33
(9.) Horticultural College, Swanley	34
(10.) Glasgow and West of Scotland Technical College	35
(11.) University of Edinburgh	36
(12.) Royal Botanic Gardens, Edinburgh	37
(13.) The Incorporated Edinburgh School of Agricultural Science	38
(14.) University of Aberdeen	38
(15.) Scottish Dairy Institute, Kilmarnock	39
II. Record of Field Experiments aided by the Board of Agriculture :	
(1.) Bath and West of England Society	43
(2.) Norfolk Chamber of Agriculture	47
(3.) University College of North Wales	54
(4.) Durham College of Science	75
(5.) Essex Agricultural Society	87
(6.) Royal Manchester, Liverpool, and North Lancashire Agricultural Society	96
(7.) Highland and Agricultural Society	99
(8.) Research Association for the North-eastern Counties of Scotland	114
III. Report on Special Class for Dairy Teachers	123
IV. Report on Special Research into the processes of Cheddar Cheese-making	131
V. Suggested Syllabus of Subjects of Agricultural Instruction at Collegiate Centres	149

GRANTS FOR AGRICULTURAL EDUCATION.
1892-93. -

R E P O R T.

TO THE PRESIDENT OF THE BOARD OF
AGRICULTURE.

SIR,

I HAVE now the honour to submit the following report on the administration of the Parliamentary grant in aid of agricultural education in Great Britain, during the financial year ended 31st March 1892.

Excluding the incidental cost of inspection and organisation chargeable to this vote, the sums distributed to 34 colleges, schools, institutions, or societies in Great Britain amounted in the past year to 7,425*l*. This sum contrasts with 6,705*l*. in 1891-2, 4,840*l*. in 1890-91, 4,585*l*. in 1889-90, and 2,930*l*. in 1888-9. A list of the grants made in 1892-3 is appended to this report.

The assistance rendered by the Board to educational and experimental work has again taken considerably varied forms. As in previous years the grants have been applied to aid in the provision of the scientific and practical training essential for the higher teaching of agriculture, while endeavours have been also made to facilitate on a wider scale the acquisition of more elementary agricultural knowledge by rural schoolmasters and lecturers now largely engaged in the local work of technical education. The maintenance of facilities for direct teaching to resident pupils in collegiate institutions has also been continuously borne in mind, while increased provision of systematic and organised machinery for the diffusion of general knowledge and the promotion of a spirit of intelligent inquiry has been secured by peripatetic lectures and evening classes. The technical training both of pupils and of actual workers in single branches of agricultural industry, such as dairying, forestry, and fruit growing, has been again aided, and the outlay both of societies and teaching institutions on the provision of centres of illustrative experiments, has again demanded a considerable share of the grants.

In conformity with the requests of various county councils, the advice and counsel of the Board's inspectors have, in the past year, been more largely granted, with a view of utilising the experience acquired by general inspection as to the most economic

Scottish Metropolis. This Scheme, if effectively seconded by the technical education committees of the neighbouring county councils, will, it is hoped, result in the establishment of an important combined centre of instruction of various grades, alike for direct and systematic agricultural study, for the training of agricultural teachers, and for the organisation of extension work.

In all parts of Great Britain the inspections conducted in the past year indicate a generally growing appreciation of the work of the educational centres which have been set on foot, but it would be well if county councils were able to see their way to make more extensive use than at present of the teaching staff and equipment which are now available, by the establishment of scholarships for the more promising of their students, whose education might be materially advanced by their being able to make use of the new in-college courses.

In view of the considerable sums which the Board have felt it wise to devote to the maintenance of agricultural departments at certain colleges, attention has been drawn, in the last of the series of statements appended to this report, to the specific subjects bearing upon agriculture which are or may be taught at centres of this class.

At the present time all the matters mentioned in this syllabus are not taught at all the centres supported by the Board, but at most of them much is already done in the directions indicated, and it is understood that all the institutions hope eventually to be in a position to give the desired instruction, so far as the needs and peculiarities of each district will allow; and the suggested syllabus may act in some degree as a guide to institutions desirous of being assisted in developing schemes of agricultural education.

The concentration which experience has suggested of the direct grants of the Board to the larger teaching establishments, has necessarily led to the discontinuance of payments made to some of the minor local institutions under the system in force previous to the endowment of county councils under the Act of 1890 with funds for the local conduct of technical, including agricultural, education. But in all these cases steps have been taken to bring under the notice of the local authorities the claims of the minor teaching bodies or societies, whose work must for the future be maintained, wherever it meets the requirements of the locality, by local resources.

A special class of institutions, differing from the collegiate centres but providing dairy instruction for other than merely local areas, has from the outset been regarded as forming another series of proper recipients of the Board's grants. In some instances, where the provincial collegiate system has attained full development, dairy as well as other teaching is conducted by the localities

concerned under the auspices of the general educational centre. It has been felt, however, that assistance might still be legitimately continued to societies such as the Bath and West and Southern Counties Society, whose early classes have been largely followed as models by more recent workers, the Eastern Counties Dairy Institute, the British Dairy Farmers' Institute, and the Scottish Dairy Institute. The functions of all these bodies in co-operating with the county councils partake of the character of central technical organisations limited to the particular branch of industry in question. The character of the work thus aided and the proportion of the expenditure defrayed from local sources may be gathered from the summaries published in the appendix to this report.

Experimental work in its double form of demonstration and research has again been encouraged by grants distributed by the Board. These grants are, in the case of collegiate institutions and teaching bodies, merged in the general sums awarded, but they are specially distinguished in the cases where local agricultural societies are conducting experiments, adapted to the circumstances of their particular districts, and recognised as possessing a high educational value.

In Scotland the experiments of the Highland and Agricultural Society, spread, as described in the appendix, over a large number of individual counties, and the work conducted in the neighbourhood of Aberdeen by the Agricultural Research Association for the north-east counties again received considerable assistance; while the minor demonstration work conducted locally in Orkney was once more the recipient of a grant. In the south of England, the Bath and West and Southern Counties Society has continued its useful work in nine counties. In the east, the experiments of the Norfolk Chamber of Agriculture have been again continued, on the lines before explained, while on a smaller scale the work of the Royal Manchester and the Essex Agricultural Societies received recognition. Full extracts are given in the appendix, explanatory of the experiments aided. These details are taken from the reports of those in charge of the experiments, and their publication may be of use in view of the recent permission given, by the Science and Art Department, to local authorities to apply their technical education funds to work of this nature, where a direct educational use is made of the experiments.

The special research again undertaken at the request of the Board by the Royal Agricultural Society, continued the enquiries previously conducted into the use of dressings of sulphate of copper as a preventive of potato disease. As on a former occasion, these experiments are described at length in a report furnished by the Society and published, with other information on this interesting subject, in a general report separately presented to Parliament.

In view of the practical interest which continues to attach to the more systematic and minute investigation of various scientific questions underlying the customary processes employed in the manufacture of cheese, and important to the future of dairy teaching, the Board have renewed their support to the further investigations carried on at the Cheese School of the Bath and West Society.

In two new directions the Board have been enabled to afford assistance to the development of Agricultural Education in the past financial year. In conjunction with Her Majesty's Commissioners of Works, arrangements were made for courses of lectures to practical foresters and gardeners employed during the day on the staff of the Royal Botanic Gardens and in private nurseries at Edinburgh. Means have thus been found for imparting instruction, in the sciences underlying forestal and horticultural practice, to a class of persons who are not in a position to avail themselves of the regular courses of instruction in forestry now established in the University, or of the horticultural training elsewhere provided.

In view of the advantage which the experience acquired in repeated inspections showed would be gained by the provision of a special course of higher instruction for those engaged, under county councils or educational establishments, in conducting dairy classes and demonstrations in Great Britain, the Board also made arrangements for the holding of a three weeks' class at Bangor in the month of February last for dairy teachers from all parts of the country. The applications for the privilege of attendance were very numerous, and with a view to the efficient instruction of those present, they could not all be complied with; but the number applying indicated how widely the need of facilities for acquiring a more thorough grasp of the scientific reasons and explanations of the lessons now inculcated in dairy practice was felt by those engaged in teaching. The instruction given embraced practical lessons in the manufacture of soft and fancy cheeses, lectures on dairying generally, and the management of a dairy farm, and on chemistry, botany, and bacteriology as applied to dairying, with demonstrations and discussions. The inspector's report on this class is reproduced in the appendix.

As indicated in the report for the previous year, the Board are now called upon by certain county councils to undertake inspection of the whole or of certain parts of their work in relation to technical instruction in agriculture.

In the financial year 1892-3, the whole of the agricultural instruction carried on by the Northumberland, Cumberland, and Hampshire County Councils, and the dairy work undertaken by the council for Rutland, was inspected at the request of these bodies. Full reports on the work of the year, together

with suggestions and advice for the future, have been rendered to each council whose work has been inspected.

The county councils of Cheshire and Derbyshire have now approached the Board, asking for similar inspection. The Oxfordshire Council have requested the Board to undertake the regular inspection of their dairy work, and applications have been received from the Kent County Council for advice respecting horticultural instruction, and from the Devon County Council for inspection and advice in connection with the development of an agricultural side to a secondary school in that county. In the belief that the experience acquired in testing the varied forms of agricultural teaching now in operation may be thus usefully employed to the advantage of the local authorities charged with the conduct of this instruction, the Board have acceded to these requests.

I have the honour to be, Sir,

Your most obedient servant,

Board of Agriculture,
August 1893.

P. G. CRAIGIE.

LIST OF GRANTS AWARDED.
1892-93.

Name of Institution.	Work.	Grant in 1892-3.
ENGLAND AND WALES.		
		£
University College of North Wales, Bangor -	Collegiate centre -	800
Yorkshire College, Leeds -	Collegiate centre -	800
Durham College of Science, Newcastle-on-Tyne -	Collegiate centre -	800
University College of Wales, Aberystwyth -	Collegiate centre -	500
Cambridge and Counties Agricultural Education Committee.	Collegiate centre -	100
Bath and West and Southern Counties Society	Special cheese research	250
	Agricultural experiments	150
	Dairy instruction -	150
Eastern Counties Dairy Institute -	Dairy instruction -	350
British Dairy Farmers' Association -	Dairy instruction -	250
Aspatia Agricultural College -	General instruction -	200
North-eastern County School, Barnard Castle -	General instruction -	100
Royal Agricultural Society of England -	Special experiments on potato disease.	100
Norfolk Chamber of Agriculture -	Agricultural experiments	100
Leicestershire Agricultural Education Committee	Dairy and general lectures.	100
Horticultural College, Swanley -	Horticultural instruction.	50
Essex Agricultural Society -	Agricultural experiments	25
Royal Manchester, Liverpool, and North Lancashire Agricultural Society.	Agricultural experiments	25
SCOTLAND.		
Glasgow and West of Scotland Technical College	Collegiate centre -	600
University of Edinburgh -	Schoolmasters' class -	350
	Forestry class -	100
Scottish Dairy Association, Kilmarnock -	Dairy instruction -	250
University of Aberdeen (Fordyce Trust) -	General instruction -	200
Highland and Agricultural Society -	Agricultural experiments	200
Aberdeen Agricultural Research Association -	Agricultural experiments	150
Incorporated Edinburgh School of Agricultural Science.	General instruction -	100
Wigtownshire Dairy Association -	Dairy instruction -	75
Angus and Mearns Dairy School -	Dairy instruction -	75
Heriot Watt College -	General instruction -	50
Dounby Science School, Orkney -	Agricultural experiments	25

SPECIAL CLASSES.

Class for the instruction of Dairy Teachers -	250
Class for the instruction of working Foresters and Gardeners in the Royal Botanic Gardens, Edinburgh.	150

APPENDIX.

CONTENTS.

	Page
I.—EPITOME OF REPORTS ON CERTAIN OF THE INSTITUTIONS RECEIVING GRANTS :	
(1.) University College of North Wales, Bangor - - -	1
(2.) Yorkshire College, Leeds - - -	6
(3.) Durham College of Science, Newcastle-upon-Tyne - - -	15
(4.) University College of Wales, Aberystwyth - - -	23
(5.) Cambridge and Counties Agricultural Education Committee - - -	27
(6.) Bath and West of England Society - - -	30
(7.) Eastern Counties Dairy Institute - - -	31
(8.) British Dairy Farmers' Association - - -	33
(9.) Horticultural College, Swanley - - -	34
(10.) Glasgow and West of Scotland Technical College - - -	35
(11.) University of Edinburgh - - -	36
(12.) Royal Botanic Gardens, Edinburgh - - -	37
(13.) The Incorporated Edinburgh School of Agricultural Science - - -	38
(14.) University of Aberdeen - - -	38
(15.) Scottish Dairy Institute, Kilmarnock - - -	39
II.—RECORD OF FIELD EXPERIMENTS AIDED BY THE BOARD OF AGRICULTURE :	
(1.) Bath and West of England Society - - -	43
(2.) Norfolk Chamber of Agriculture - - -	47
(3.) University College of North Wales - - -	51
(4.) Durham College of Science - - -	75
(5.) Essex Agricultural Society - - -	87
(6.) Royal Manchester, Liverpool, &c. Agricultural Society - - -	96
(7.) Highland and Agricultural Society - - -	99
(8.) Research Association for North-eastern Counties of Scotland - - -	114
III.—Report on Special Class for Dairy Teachers - - -	123
IV.—Report on Special Research into the Processes of Cheddar Cheese-making - - -	131
V.—Suggested Syllabus of Subjects of Agricultural Instruction at Collegiate Centres - - -	149

I.—EPITOME OF REPORTS ON CERTAIN OF THE INSTITUTIONS RECEIVING GRANTS.

(1.) THE UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

The work of the Agricultural Department of this College has during the past year continued on the lines previously laid down. Consolidation of existing arrangements rather than the development of new plans has been the work of the year.

The In-College Class has numbered in all 9 students, of whom 8 are taking the complete 2 years' course and one a course in chemistry.

Those taking the full course are as follows:—

Second year students	-	-	-	2
First	„	-	-	6

Of these last three come with scholarships from the Cheshire County Council and one from the Carnarvonshire County Council. It would be of great advantage if the neighbouring local authorities realised, more fully than they do at the present, the benefits to be derived from such a course; possibly, however, they may do so when secondary education in Wales has been well started.

The Local Work from this collegiate centre has been as follows :—

The peripatetic work has comprised more continuous class teaching than heretofore, and from all the reports which are to hand, the results of the instruction which has been given are encouraging. The quality of butter coming to the local markets is said to be decidedly improving, while those who make both it and cheese report that they are receiving better prices and have more regular sales.

The following are details respecting the three dairy schools.

Opened 1st April and closed 30th September.

Number of pupils 11, of whom 8 learnt cheese-making.

Pupils attended on the average for 2 weeks.

Outside work consisted of :—

Butter-making :—4 courses of 10 to 12 days each at 2 centres :

42 pupils took the full course.

Cheese-making :— Demonstrations of 6 days and 1 day each at two centres. The single demonstration was held at a local show, and it is believed to have been the first attempt of the kind (viz., to actually make a cheese at a show) ever made.

Result of examinations:—

Ordinary certificate in butter-making -	-	- 16
---	---	------

cheese-making 2

Advanced certificate in general dairy work	-	-	4
--	---	---	---

A feature of the classes held at one centre visited was that several girls from the elementary schools received instruction after school hours. The experiment was apparently attended with success. Arrangements were also made with the masters of the schools, that the subjects which the elder children took for dictation had some reference to dairy matters.

Opened 1st May and closed 31st October.

Number of pupils 39, of whom 24 learnt cheese-making.

Pupils attended on the average for 3 weeks.

Outside work consisted of:—

Butter-making:—3 courses of instruction (1 of 15 and 2 of 10 days duration) at 3 centres.

46 pupils took the full course.

Results of examinations :—

Ordinary certificate in butter-making .	-	- 17
---	---	------

" " cheese-making - 9

Advanced certificate in dairy work	-	-	-	5
------------------------------------	---	---	---	---

3. Bangor School :—

Opened 1st May and closed 8th October.

Number of pupils learning butter-making, 27.

Pupils attended on the average for 2 weeks.

Outside work consisted of:—

Butter-making:—2 courses of instruction (1 of 5 days and 1 of 6 days) at 2 centres.

45 pupils took the full course.

15 demonstrations at 13 centres (2 at 2 centres and 1 at 11).

Results of examinations:—

Ordinary certificates in butter-making - - - 17

A comparison of the above work with that in the previous year shows not only that, with the exception of the cheese-making demonstrations which were carried out in 1891, there was more outside work done on the whole last year, but that a considerable increase took place in the number of pupils who gained certificates at the annual examinations. The following is a comparative statement of the results of the two years.

Certificates granted.	1891.	1892.
Advanced certificate in general dairy work - - -	1	9
Ordinary butter-making certificates - - -	26	48
Ordinary cheese-making certificates - - -	4	11

The importance of the increase in the number who gained certificates in the latter year arises from the fact that the examination is a very thorough one. It is conducted by one outside examiner, one representative of the school, and one representative of the college, and the success of pupils depends not only on the knowledge they have acquired at the school, but on the practical training they have gone through at home. An ordinary certificate in butter-making, then, it is claimed, is of a much higher character than that given at other places after a 10 days' course at a travelling school, and the holder of such a certificate, whether for butter or cheese-making, can produce it as an evidence that she is qualified to act as a *dairy maid*. Such certificates, then, are of definite commercial value to those who can obtain them.

The report of the examiners last year shows that on the whole the quality of the work done by the pupils at the different schools has improved.

Field Experiments.—These, as in the previous year, occupy a prominent position in the work of this College. The different sets of experiments in operation during the year amounted to 31, and were carried out in the following counties:—

Carnarvon - - - - -	7 sets
Anglesey - - - - -	13 "
Merioneth - - - - -	1 "
Montgomery - - - - -	6 "
Denbigh - - - - -	4 "

The experiments themselves had reference to the following objects:—

1. The testing of the value of various manures for:—

Swedes - - - - -	8 sets in 3 counties
Grass land - - - - -	13 " 4 "
Mangels - - - - -	4 " 1 county
Potatoes - - - - -	3 " 1 "

2. The effect of various dressings over a rotation of crops, 1 set in 1 county.
3. The growth of 21 different grass seed mixtures to test their suitability for hay and pasture, 1 set in 1 county.
4. The growth of 40 plots of forage and pasture plants, 1 set in 1 county.

These two last sets of experiments merit special mention. It is the first time that anything of the sort has been attempted in Wales, and the growth of various grasses and forage crops hitherto unknown to the farmers of the district cannot fail to be of very great advantage to them.

As a general rule, when a set of experiments is instituted, the land and labour is found by the tenant; the College bears the cost of measuring out the plots, which is done by one of the staff; and the county council pays the cost of the manure, the travelling expenses connected with the experiments, and the publication of the results.

An inaugural lecture explaining the object of the experiments is frequently given, and at the end of the season, when the results are known, a lecture setting forth those results is always given in connection with each group of experiments of similar nature. These experimental plots, therefore, have a direct educational value.

Besides, however, the interest which centres in them locally, they have been very generally noticed in the public press, and as a consequence, questions concerning them have been addressed to the College from persons in England, Scotland, and Ireland, entailing an immense amount of correspondence willingly entered into on the part of those conducting them.

Carried on, as many of them are, under great difficulties and in most inaccessible parts of the country, their value cannot easily be over-estimated. As an instance, one place visited may be quoted, where a set of experiments on the improvement of pasture land was about to be instituted. The farm was 18 miles from the nearest station, and the only manure other than farmyard known and applied in the district was lime, which had to be carted a distance of some 20 to 30 miles. The land was very poor, and in need of manuring. The value, therefore, of demonstrating the benefit to be derived from the use of concentrated artificial manures in such a place, if only in the matter of economy as regards haulage, is at once apparent.

All the experimental stations visited showed that the experiments were planned with judgment and were carefully carried out, while the interest shown by the various farmers on whose land the experiments were conducted and their evident desire to profit by the results obtained was very pleasing. The value of the experiments seems to be appreciated by the county councils in the district, several of which have allocated a considerable portion of the sums which they have devoted to agricultural education to this branch of technical instruction.

Extension Lectures.—Members of the agricultural staff have continued to give these during the winter season. Courses of from 5 to 12 lectures on various subjects have been given as under:—

Carnarvonshire	5	centres	average attendance,	25
Anglesey	3	"	"	70
Denbighshire	2	"	"	100

Lectures varying in number from 1 to 4 have been given in—

Carnarvonshire	at	6	centres.
Anglesey	"	4	"
Montgomeryshire	"	4	"
Denbighshire	"	5	"

The average attendance at these centres seems to have varied from 10 to 100.

In addition to the above, various lectures have been given in connection with the travelling dairy schools.

Extension lectures are now, as a rule, only undertaken for county councils, but these bodies at present do not pay more for them than the travelling expenses. An exception, however, to this is the Carnarvonshire Council, by whom a sum is guaranteed to defray the salary of an extension lecturer.

Training of Elementary School Teachers.—Complete Saturday courses, which here consist of—

1st year.—Agriculture, 16 lectures.
2 farm excursions.

Chemistry, 8 lectures.
Botany, 8 lectures.

2nd year.—Agriculture, 16 lectures.
2 farm excursions.
Agricultural chemistry, 8 lectures.
Zoology and physiology, 8 lectures,

have been given at the following centres:—

Carnarvonshire, 1st year's course, average attendance,	22.
Montgomeryshire, " " "	17.
Flintshire, 2nd " " "	19.

The Cost of the entire work of the Agricultural Department at this College for the year has amounted to nearly 2,200*l.*, of which close upon 500*l.* has been incurred on behalf of five county councils for field demonstrations, extension lectures, dairying, and schoolmasters' classes. Subscriptions and donations during the past year have amounted to over 800*l.*

In conclusion it should be noted that much work emanates from the College which cannot be described under any definite head. The lecturer on agriculture, for instance, is in constant communication with local technical education committees, having attended no less than 60 of their meetings during the past year, while, from several matters coming under personal observation, it is evident that the work is telling with the farmers in North Wales, and that the College is getting steady hold upon their sympathy and good will.

(2.) THE YORKSHIRE COLLEGE, LEEDS.

Agricultural Education throughout the three Ridings of Yorkshire continues to be organised under the direction of the above College, but, although much appreciation is apparently shown for the work outside the College, farmers in this district, as elsewhere, still seem scarcely to realise the great advantage placed at their disposal as regards their sons by means of the In-College courses, which consist not only of the now regular two years' course, but also of courses lasting for as short a time as 10 weeks in the winter for those who are unable to devote a longer period to study.

The students who have been taking the full two years' course have been six in number, viz. :—

Second year students	-	-	-	-	-	1
First year students	-	-	-	-	-	5

Of these last, one comes as a free scholar through the West Riding County Council, and another holds a scholarship from the Staffordshire Council.

The short winter course was only attended by two students.

It is understood that all the above students are intending to be either farmers or agents.

The class has now the benefit of having the run of six farms in the vicinity, and to these it is taken regularly. The farms consist of three large ones of a mixed character, and three smaller dairy farms. The class spends on these farms one afternoon per week in winter and three in summer.

As has been pointed out on a previous occasion, a certificate can be obtained by a student at the end of the two years' course, but, unless he has done so before coming to the College, he must reside on an approved farm and give satisfactory evidence of his good conduct there before the certificate is actually granted.

The Local Work of the College as regards agricultural instruction has continued in a satisfactory manner.

Dairy instruction was carried on by means of the three travelling schools, and the classes in butter-making held have, as a rule, been of 10 days' duration. The total number of pupils attending the schools has been a trifle less than in 1891-2, but the average length of attendance of each pupil has been greater.

The conditions under which the schools are worked by their respective county council committees continue to vary. In the West Riding the council leaves all local expenses, such as hire of room, milk or cream required, labour, printing, and advertising, to be paid for by the local committee. In the North Riding the council does the same, but pays back to the committee 1*l.* for each day on which the school may be open at any place. In the East Riding all local expenses are defrayed by the council.

As a rule the number of pupils in a class is limited to eight, but occasionally this number (which is quite enough for one teacher) is allowed to be exceeded.

The number of centres visited by the travelling schools, and courses of 10 days' duration held, is as follows:—

YORKSHIRE COLLEGE.

Yorkshire.	Centres visited.	Courses of Ten Days given.	Courses of Five Days given.	Total Number of Pupils.
West Riding - -	8	9	—	119
North Riding - -	5	7	2	126
East Riding - -	6	11	—	106
Total - -	20	27	2	351

At Leeds, the West Riding Dairy School carried out a series of cream-raising tests for the county council, with a view of determining the relative economy of the Separator, the Jersey creamer, and the Shallow-setting system.

The average results of 4 days' experiments, with similar quantities of milk, were as follows:—

	lbs.	oz.		s.	d.
Separator - -	1	14	average value per lb.	1	2 $\frac{3}{4}$
Jersey creamer - -	1	9 $\frac{3}{4}$	" "	1	2 $\frac{1}{2}$
Shallow pan - -	1	7 $\frac{1}{4}$	" "	1	1 $\frac{3}{4}$

There was thus a distinct gain through use of the separator over the other systems, not only in the total amount of butter obtained, but also in its relative value.

The general effect of the teaching given by means of the travelling schools, has, apparently, been better prices and a more regular and certain sale for the butter produced in the district. At the end of each course a competition has been held, and certificates given for manual proficiency in butter-making, while either at the beginning or end of each course, a lecture is given either by the professor of agriculture or one of the extension lecturers.

Field Experiments.—It was expected that, before the close of last financial year, stations of demonstration or experiment would have been instituted in each Riding. Owing, apparently, as much as to anything else, to doubt on the part of the county councils as to whether money could be legally employed on such objects, these stations, so useful elsewhere, are still almost entirely lacking in Yorkshire.

A grant, however, of 100*l.* was made by the West Riding Council to the Farmers' Club at Selby, and by this means experiments were carried out on potatoes and turnips. The results as regards the former crop seem to have been useful, but the turnip experiments were unfortunately spoilt by the severe floods of last autumn.

Extension Lectures.—The interest taken in this class of instruction appears to increase. During last year there were three lecturers whose whole time for the season was employed in the work, and one (the veterinary lecturer) whose time was largely but not entirely taken up with it; this is in addition to any work undertaken by the professor of agriculture.

The objects which, with much clearness, the College authorities urge they have in view in promoting this class of work, are as follows:—

“The aim of those who arrange these courses is not to substitute science for practice, but to unite theory and practice by gathering together and presenting to farmers in a concise and simple form those points of science and results of research which have a direct bearing upon farming and distinct utility to the farmer.

"No one will question the fact that there are numerous points of such practical science, which are of the deepest interest and the highest value to those connected with the cultivation of our land.

"A knowledge of the characteristics of their constituents, will give a power of adaptation to the fluctuation in the market prices of foods, which will often enable a cheaper feeding stuff to be substituted for a more costly one, with an equally good result.

"The recognition, again, of grass and clover seeds, and the detection of the various impurities that may occur among them, are matters of practical botany, of which every farmer will readily see the importance.

"Similarly, in the selection and application of manures for the crops, a thorough appreciation of the relation of the various substances contained in the manures to the growth of plants, and to the needs of each crop in particular, is essential to obtain the best result at the least possible cost."

A list of the courses, which are systematically arranged according to a syllabus, and which usually consist of 12 lectures, is appended, together with specimens of the syllabus.

The number of centres at which classes were held was as follows:—

West Riding	-	-	15 centres, average attendance,	40
North Riding	-	-	15 " " "	28
East Riding	-	-	*13 " " "	60

* At two of which a second course was held.

Taking the county as a whole, and comparing the past year's extension work with that of the preceding year, the following results are apparent:—

1891-92, number of lectures given, 465; average attendance per lecture, 35.

1892-93, number of lectures given, 524; average attendance per lecture, 43.

At all the centres personally visited, the audience seemed to be thoroughly interested in the course, and the value of the instruction given is enhanced by the useful printed information published by the College and circulated amongst the class. In addition to matter of that character, the College has now provided, by means of the county councils, seven sets of "travelling libraries," which are lent out to a class, if desired, for the whole time that a course of lectures is being given.

Besides giving lectures, it is the duty of the extension lecturers, whenever they can, to visit farms and give advice to the occupiers. Occasionally, too, farm classes have been held in connection with the courses of lectures, while gardening classes have been held at certain places, the lecturer having visited the allotments, and given instruction on the spot in matters such as budding, grafting, &c.

To much of this personal influence imported into the work, as well as to the character, practical as well as scientific, of the lecturers employed by the College to do this work for the county councils, is the success of extension lecturing in Yorkshire due. Manures, such as basic slag and potash manures, previously entirely unknown in parts of the county, are now in very general use, and it is estimated that the annual money value of these courses of lectures to the farmers of Yorkshire, in saving them from useless or injudicious expenditure, as well as in promoting that which is beneficial, is already something very considerable.

Training of Elementary School Teachers.—Classes for teachers were again held for three weeks in the summer at the College, and throughout the winter at local centres. The summer course consisted of lectures

I.—EPITOME OF REPORTS ON INSTITUTIONS AIDED. 9

on agriculture, chemistry, and botany, together with practical work in chemistry and botany each day. The hours devoted daily to instruction were :—

9-10	Chemistry or botany.
10-12	Laboratory.
12-1	Agriculture.
2-3	Botany or chemistry.
3-5	Laboratory.

An inspection of the class during the summer left the impression that the members were not only capable of working, but inclined to work hard.

The numbers present at this class seemed to have depended entirely on the financial encouragement offered by the county councils.

The East Riding Council gave each teacher his travelling expenses and 3*l.* maintenance allowance.

„ North „ „ no travelling expenses, but 3*l.* maintenance allowance.

„ West „ „ no travelling expenses or maintenance allowance..

The numbers attending were :—

From the East Riding	-	-	-	28
„ North „	-	-	-	19
„ West „	-	-	-	6
				—
Total	-	-	-	53
				—

The members of the class underwent examination at the close of the course, and 50 out of the 53 passed this in a satisfactory manner.

The Saturday classes throughout the winter were held at six centres, with an average attendance of 337. This compares favourably with the preceding year, when classes were held at five centres, with an average attendance of 215.

Those teachers who go through two winter courses and one summer course of instruction are eligible for certificates of the Victoria University, of which the Yorkshire College forms part.

The total expenditure of the Agricultural Department of this College during the year was within a fraction of 5,000*l.*, of which nearly 3,800*l.* represents the cost of the work done for county councils.

Subscriptions received amounted to 404*l.* and fees to 57*l.*

LIST OF UNIVERSITY EXTENSION LECTURERS IN AGRICULTURE,
AND-TITLES OF THEIR COURSES.

THE PROFESSOR OF AGRICULTURE IN THE YORKSHIRE COLLEGE, LEEDS :—

1. Dairy farming.
2. Pastures and pasture plants.
3. Soils—their origin, formation, and improvement.
4. Manures and feeding stuffs.

THE COUNTY LECTURER ON AGRICULTURAL CHEMISTRY AND BOTANY OF THE YORKSHIRE COLLEGE, LEEDS :—

1. Structure and growth of plants.
2. Soils and their properties, with special reference to the soils of the district.
3. Moorland soils ; their reclamation and treatment.

4. Food of plants.
5. The action of manures.
6. Manures in relation to soils and crops.
7. The elements of dairy chemistry.
8. The composition and nutritive value of feeding stuffs.
9. The management of grass land.
10. Diseases of crops.
11. Principles of horticulture.
12. Fruit culture in Yorkshire.
13. The management of allotments.

THE COUNTY LECTURERS ON AGRICULTURE OF THE YORKSHIRE COLLEGE,
LEEDS:—

I.

1. Small farming.
2. Soils.
3. Manures and manuring.
4. The selection and management of farm crops.
5. Insect pests and diseases of crops.
6. Dairying and poultry keeping.
7. Live stock and feeding stuffs.
8. The labour of the farm.
9. Seeds, grasses, clovers, and pastures.

II.

1. Soils, their properties, exhaustion, and improvement by means of tillage, manuring, &c.
2. Plants, their structure, growth, and relations to the soil.
3. Agricultural seeds, determination of purity, &c. (This course is mainly practical).
4. The best forage plants (grasses, clovers, &c.)—their growth, value, &c.
5. Farm crops, their cultivation, management, and use in rotations, &c.
6. Plant diseases, and insect ravages—their determination, prevention, and remedies.
7. (a.) Natural and artificial feeding stuffs; (b.) Natural and artificial manures.
8. Farm live stock.
9. Dairy farming, including management of pastures and meadows.

III.

1. Cultivation and improvement of soils—natural and artificial manures.
2. Growth and management of field crops.
3. Live stock—foods and feeding.

THE LECTURER ON VETERINARY SCIENCE IN THE YORKSHIRE COLLEGE,
LEEDS:—

The course of lectures on veterinary subjects will deal with questions of special interest in the particular localities in which it is delivered, and will include sections from the following:—

- (a.) *Ready Methods of Treatment in Emergent Cases.*—Hoven in cattle and sheep, choking, hemorrhage in general, poisoning, wounds, bleeding from wounds, ordinary accidents, &c.
- (b.) *Blood Diseases.*—Scrofula, tuberculosis, contagious pleuro-pneumonia in cattle, foot-and-mouth disease in cattle and sheep, splenic fever, anthrax, black quarter, &c.
- (c.) *Parasitic Diseases.*—Those produced by worms, sturdy in sheep, liver-rot, hoose, scab, &c.
- (d.) *Diseases connected with Parturition.*—Inversion of womb, abortion, dropping after calving, garget, &c.
- (e.) *Diseases of Digestive Organs.*—Affections of mouth, rupture or hernia, indigestion, colic, diarrhoea, white scour or skit, moor-ill or wood evil, &c.
- (f.) *Diseases of Respiratory Organs.*—Catarrh, roaring, congestion, an inflammation of the lungs, &c.
- (g.) *Disorders of Urinary Apparatus.*—Retention of urine, excessive staling rupture of bladder, &c.
- (h.) *Hygiene.*—Embracing ventilation, drainage, feeding, &c.

(i.) *Infection and Contagion.*

(k.) *Rural Surgery.*

The subjects numbered 1, 2, &c. in the above lists are titles of courses of 10 lectures each, and not of single lectures; those lettered (a), (b), &c. in the veterinary course are, on the other hand, titles of single lectures.

The several courses are illustrated when necessary by blackboard, diagrams, lantern views, and experiments, as well as by museum specimens, models, and practical demonstrations.

Each course consists of 10 lectures, given in the afternoons or evenings, at intervals of one week. It is followed by a class, at which questions may be asked of the lecturer. Examinations are held at the close of the course for those who desire to take advantage of them, and those who pass successfully receive certificates from the Victoria University.

SYLLABUS OF SUBJECTS.

MANURES.

The Plant.—Composition; organic and inorganic constituents.

Life History of Plant.—The seed; its composition; germination; conditions required; changes taking place; how the plant feeds and grows.

Occurrence of Plant Food in Nature.—Carbon dioxide; water; potash; phosphoric acid; lime; magnesia; sulphur; iron; nitrogen.

Sources of Nitrogen in Soil.—Action of nitrifying organisms; difference between leguminous plants and others in mode of obtaining nitrogen.

Causes of Waste of Plant Food from the Soil.—Absorptive powers of soils.

Manuring.—Potash, phosphoric acid, and nitrogen most needed; effect of different classes of manures on crops; condition of soil affects manuring.

Classification of Manures.—General; special; uses and advantages of each class.

Farmyard Manure.—Composition; circumstances affecting composition and value; the kind and condition of animals producing it; their food; the quality and quantity of litter used; management and preservation.

Protection from Weather advantageous.—Covered yard and box manure; fermentation or heating; formation and fixation of ammonia; losses during fermentation; different systems of management compared.

Application to Soil.—Fresh or rotten state best according to the soil and crop; effect of frost.

Effect on Crops.—Physical effect on soil.

Sewage and Town or House Refuse.—Chiefly valuable for nitrogen; various systems of utilising; difficulties; effect of use for grass land.

Sea-weed.

Green-manuring.—Advantage in keeping land under crop.

Other Vegetable Manures.—Sawdust; peat; leaves; tanner's bark; grains.

Rape Cake.—Composition; uses; effects; other feeding cakes useful if not too expensive.

Special Manures.—Classification; animal; mineral; nitrogenous; phosphatic; potash.

Flesh Meal.—Dried blood; shoddy; feathers, hair, horns, &c.

Guano.—Formation, composition, and value; nitrogenous guanos; Peruvian, &c., ichaboe; phosphatic guanos; mejilloms, &c.; easy methods of determining purity or adulteration; valuation of guano from analysis; uses for various crops.

Dissolved Guano.—Ammoniated guano; bat's guano; fish guano.

PHOSPHATIC MANURES.

Bones.—Composition; comparative value of finely or coarsely ground bones; suitability for various crops; boiled or steamed bones; bone black; bone ash; fermented bones; dissolved bones.

Mineral Phosphates.—Value depends on phosphoric acid present; coprolites; Canada and other phosphates; manufacture of superphosphate; action of acid on insoluble phosphate; meaning of term "soluble phosphate"; effect of impurities in phosphate; use of superphosphates on various soils; action in soil.

Formation of Reduced Phosphate.—Thomas phosphate; composition; importance of fine grinding; uses; precautions in mixing with other manures.

Nitrogenous Mineral Manures.—Nitrate of soda; action on plant and soil; sulphate of ammonia; comparative value.

Potash Manures.—Kainit; saltpetre.

Lime.—Composition of limestone affects value; methods of applying to soil; different times of year for applying; effect on soil and crop.

Chalk.—Lime road scrapings; gas lime; gypsum.

Common salt.

FEEDING STUFFS.

Distinction between Plants and Animals in Food required.—Composition of animal; digestion and assimilation of food; how used in the body; for repair of waste; for formation of increase; for the production of heat and work; uses of blood, lungs, &c.; work either external or internal.

Constituents of Food.—Mineral constituents; importance and use to animal; salt; non-nitrogenous constituents; fat or oil: carbohydrates; fibre; nitrogenous constituents; albuminoids; amides; nitrates, &c.

Importance of proper proportion of various Constituents.—Effect of variation in proportion on digestibility; importance of water; too much is harmful.

Difference between various Animals in power of digesting Food.

Value of Shelter.—Covered yards; loss, however, if not enough ventilation.

Food requirements for different Classes of Stock.—Advantage of early maturity from feeder's point of view.

Feeding Stuff.—Classification; concentrated and bulky.

Concentrated Foods.—Linseed cake; composition; varieties; impurities and adulterants; difference in value between cakes rich and poor in oil; cotton cake; decorticated and undecorticated; composition, uses, and disadvantages; rape cake; other less common feeding cakes; grains, wheat, oats, barley, maize, &c.; peas, beans, &c.; meals; bran, &c.

Bulky Foods.—Hay; composition; comparative value of constituents in bulky and concentrated foods; variation in quality of hay with time of cutting; straw; grass; roots; brewer's grains.

Composition a Guide to Value of Feeding Stuff.—Methods of estimating comparative values of foods.

Importance of proper relation between Quantities of Nitrogenous and Non-nitrogenous Substances.—"Albuminoid ratio."

Methods of substituting Mixtures of Foods for one another to suit the Fluctuations of the Market.—Of determining whether any given food can be used with economy.

Food required by various Classes of Stock.—"Feeding Standards"; compounding rations for fattening cattle; for milking stock.

The manurial Value of Foods.—Lawes and Gilbert's tables; how calculated; live weight and carcase weight.

DAIRY FARMING.

Milk.—Formation; structure of udder and milk glands; composition; properties of the various constituents; fat; casein; albumin; sugar; mineral matter; variation in the composition of milk; causes; character of the animal; breed; age; health; time since calving; food; season, &c.

Methods of testing the Quality of Milk.—Lactometer; creamometer; lactoscope; lacto-butyrometer.

Suitability of various qualities of milk for butter-making, cheese-making, &c.

Milking.—By hand; by machine; possibility of injury to the milk; management in the dairy; changes liable to occur in the milk; action of micro-organisms; conditions favouring growth and development.

Separation of Cream.—Shallow setting; deep setting; Jersey creamer; mechanical separators; mode of action of each; comparative economy of the various systems.

Skimmed Milk.—Composition and uses; cream; composition; cream setting; requirements for success; advantages.

Butter-making.—From whole milk; from cream; ripening cream; effect of over ripening; ripening with salt.

Utensils required.—Churn; butter worker; thermometer; Scotch hands; temperature can, &c.

Temperature for Churning; churning; washing; salting with brine; with dry salt; working; making up.

Factories; creameries; blending houses; advantages and drawbacks.

Cheese-making.—General principles; action of rennet; of acidity; influence of temperature; action of salt; of pressure.

Cheddar system of cheese-making. Cheshire system; Stilton, &c.

Soft-cheeses; cream cheeses; general principles of manufacture.

Whey.—Composition and uses; whey butter.

The Dairy.—General construction and arrangement; various contrivances for promoting cleanliness and regulating temperature; ventilation; necessity for dryness.

Water; exercise; ventilation of cow-houses.

Keeping up a dairy herd.—By buying; by breeding and rearing.

PLANT DISEASES.

Plant Diseases.—What is disease? suitable diseases; unsuitable diseases; diseases caused by fungi; parts of a fungus; mycelium; sporangia; spores; manner in which fungi live.

Life-history of the following:—

Potato Disease.—*Peronospora infestans*.

Turnip Disease.—Finger and toe; anbury. *Plasmiodiophora brassica*.

Clover Sickness.—Various causes. *Tylenchus devastatrix*, *Peronospora trifoliorum*, &c.

Smut of Cereals.—*Ustilago carbo*.

Bunt of Wheat.—*Tilletia tritici*.

Rust of Corn.—*Puccinia graminis*.

Ergot of Rye.—*Claviceps purpurea*.

Clover Dodder.—*Cuscuta trifolii*.

Insect Ravages.—History of a metabolic insect; ova, pupa, larva, full grown insects; varieties in the mouth of insects as affecting their destructive capabilities; sucking mouth; biting mouth; compound mouth.

Varieties of Insect Pests.—Moth, fly, eelworm, weevil, beetle, milliped, click beetle, wireworm, &c.

Means of Prevention of Plant Diseases.—Pickling seed, cleaning land, top-dressings, &c.

Means of prevention of insect attacks.

Remedies to be applied for some Diseases.—Instruments or machines useful. Strawsoniser; Eclair; Souffle, &c., Bouillie bordelaise mixture. Use of sulphates of iron and copper, lime, gas-lime, soot, &c.

VETERINARY SUBJECTS.

Ready methods of treatment in urgent cases of disease and accident.

Blood diseases of animals, such as anthrax, tuberculosis, pleuro-pneumonia in cattle, foot-and-mouth disease in cattle and sheep; the most prominent, and those connected with the Contagious Diseases (Animals) Act, being specially considered.

Diseases connected with parturition.

The most common diseases and accidents producing lameness in horses.

Principles of shoeing.

Preservation of health.

When necessary, each subject will be accompanied by a simple outline of the anatomy and physiology of the parts under consideration.

The lectures will be abundantly illustrated by diagrams and preparations.

Four questions on the subject of each lecture will be given, which it is hoped will be answered in writing the following week by most of those who attend.

A quarter of an hour will be devoted to asking and answering questions on the subjects of the previous lecture, when points imperfectly understood will be explained.

The subjects for each lecture will be selected according to the requirements of particular localities.

PROPAGATION OF PLANTS BY SEEDS.

Seeds consist essentially of three parts (1) the embryo or germ, (2) a food-supply for the young seedling, (3) an outer protective coat (usually double). The food-supply may be in the cotyledons or it may be altogether outside the embryo.

The conditions necessary for the germination of well-ripened, well-kept seed are (1) sufficient moisture, (2) sufficient heat, (3) sufficient air (oxygen). The moisture softens the seed coat and causes the seed to swell, the oxygen passes through the moistened coat, and if the temperature be sufficiently high, combines with various substances in or around the embryo, and the local increase in temperature so produced quickens the embryo into active life. In the typical seed, a young root (radicle) soon appears, and shortly afterwards a young stem (plumule). Until the young roots can absorb mineral matter from the soil, and the young leaves perform

14 I.—EPILOGUE OF REPORTS ON INSTITUTIONS AIDED.

their function of preparing plant food, the seedling is entirely dependent upon the food-supply contained in the seed. When the temperature is low, this food-supply cannot be readily transported into the growing seedling, owing to the deficiency of lime in the seed, so that seeds sown in cold weather in the open (*e.g.*, early peas) are benefited by a small quantity of lime previously added to the soil.

Free root-growth in the seedling is usually encouraged by sowing on a light open compost or soil, which should be well prepared, finely pulverised, firm, sweet, and only slightly moist. The depth of sowing varies from one to four times the average diameter of the seed. Beans are sown at a depth of 3 inches; peas, $1\frac{1}{2}$ inches; cabbage, lettuce, parsnip, onion, radish, and carrot seed are only slightly covered, while minute seeds, like that of *calceolaria*, *cyclamen*, and *petunia*, are sown on the surface. Raking small seed into the soil buries them far too deeply. Seed should not be sown on a very rainy day, or when the soil sticks to the spade. The two methods of sowing in the open are broadcasting and sowing in drills. The latter is preferable, as giving better opportunities for cleaning, thinning, and detecting blanks.

Special conditions for the propagation by seeds indoors are (1) thoroughly cleaned and well-drained pans, pots, or boxes; (2) a temperature of 55° to 80° F.; (3) a moist atmosphere; (4) exposure of the seedlings to the light as soon as the first leaves show above ground; (5) removal to a cooler temperature as soon as they begin to be drawn.

The time for seed sowing is influenced (1) by the climate and other conditions required by the seedlings for their subsequent development; (2) by the time when the product is required.

(3.) THE DURHAM COLLEGE OF SCIENCE, NEWCASTLE-UPON-TYNE.

The work of this Collegiate centre, with which the county council of Northumberland had already been intimately associated, has during the past year extended in a more complete manner than before to the county of Durham, and the council of this latter county is now represented on the Agricultural Committee of the College.

Important additions are now being made to the College buildings, and a new wing is in course of erection.

The staff of the Agricultural Department has during the past year been increased by the appointment of a veterinary lecturer.

The In-College class consists of—

- 3 regular students.
- 3 taking a preparatory chemical course.
- 4 taking a preparatory veterinary course.

Ten students may therefore be reckoned as more or less taking the agricultural course.

Evening classes are held at this College, and 20 lectures each on agriculture and forestry were given during the winter. 12 pupils attended each class, and these were for the most part separate individuals.

The local work carried on by the College during the past year has been as follows :—

Dairying.—Two dairy schools, more or less under the supervision of the College, have given instruction in butter-making in both Northumberland and Durham.

Northumberland.—From September to the end of the financial year, 9 courses of instruction of 10 days' duration in butter-making were given at 8 centres, with an average attendance of 10 pupils at each course. One of these courses was held at a farm-house, an experiment being tried in order to meet the requirements of isolated districts, with a view of seeing whether instruction can usefully and efficiently be given in an ordinary dairy. The travelling dairy school in Northumberland is still under the charge of a local expert engaged by the county council, who gives popular lectures on dairying throughout the county. Altogether 17 such lectures have been given during the year.

One feature of the work was the granting by the county council of five dairy scholarships tenable for six weeks at the travelling school, and when the instructress returned from the Bangor class at which she was present, the scholarship holders had an extra and special course arranged for them, and at this the professor of agriculture and the lecturer on agricultural chemistry attended and gave special lectures to the pupils.

Durham.—As before, the entire management of the travelling dairy school is left to the College. During the year 12 centres have been visited and 23 courses of 10 days each held at these; the average attendance at each course has been 17.

In both counties at the end of a 10 days' course an examination is held. Practical work is, of course, done at this examination, and is accompanied by an oral or written examination (at the option of the pupil) in the theory of the subject. As the result of examination certificates of attendance and of having obtained a certain per-centage of marks in the theory are given to successful pupils.

The number of pupils who obtained certificates last year are as under:—

Northumberland	-	-	-	-	65
Durham	-	-	-	-	317

Field Experiments.—These have been initiated and carried on in Northumberland during the past year as follows:—

- On turnips at four stations, in duplicate, chiefly with a view to finding out the best phosphatic manure to use in the locality.
- ” turnips at one station, in duplicate, to test the value of fish guano.
- ” oats at one station, in duplicate.
- ” potatoes at one station in duplicate.
- ” grassland at two stations, in duplicate.
- Rotation experiments, extending over a four-course shift, at one station in duplicate.

These experiments have been most carefully thought out and conducted, and lectures were given in connection with all of them (except one); thus the results were able to be brought home to the farmers of the district in an effectual manner.

In Durham, during the past year, only a commencement was made with experiments, but several stations have now been formed in that county, and are being carried on during the current season.

Extension Lectures. These have been carried on in the two counties as follows:—

Northumberland.—Excluding the lectures given to explain the results of the manurial experiments, 34 sets of lectures were given at 32 centres, but at only one centre, where there was a course of 10 lectures given, did the number of lectures exceed four for the course. The average attendance has seemed to vary according to the subject. Attendance at lectures explaining the results of experiments has averaged 65, whereas that on general agricultural subjects by the same lecturer has averaged 34. The attendance at lectures on veterinary science has averaged 25, and that at lectures on agricultural chemistry 14.

Durham.—Excluding one single lecture on experiments, 13 sets of lectures have been given at 9 centres; the course has varied, in number of lectures given, from 10 to 12, and the average attendance (in absence of returns from certain centres) would seem to have been about 30.

The lectures in both counties are given in accordance with a regular syllabus, and those delivered in county Durham seem specially noticeable in this respect. A copy of this syllabus is appended.

Training of Elementary School Teachers.—A summer and a winter course has again been held at the college. That in the summer lasted three weeks, and consisted of—

Agriculture	-	30 lectures	-	
Chemistry	-	15	”	36 hours laboratory
Botany	-	6	”	24

Instruction in physics and experimental mechanics was also available for teachers who desired to have it.

The work in the botanical laboratory had special reference, amongst other matters, to plant diseases (rust, potato disease, &c.), and seems to have been useful.

The winter (Saturday) classes comprised instruction in agriculture and botany, with laboratory work.

The summer course was attended by 19 teachers. At the winter course 29 teachers attended lectures on botany (all with the exception of two taking the practical work), and 16 attended the lectures on agriculture.

The certificates given to teachers are of two sorts, viz., class and departmental. The former are given at the end of each summer or winter course; the latter are only given after a teacher has been through two courses, either winter or summer, or one of each. In September 1892, 25 teachers sat for the departmental examinations in agriculture, chemistry, and botany, and 24 passed.

Some of the local classes conducted by teachers who had received instruction at the College were, during the winter, examined by the professor of agriculture, who expressed himself as pleased with the results, and personal inspection of classes in Northumberland left the impression that the teachers might do useful work in the elementary stages of agricultural education.

The total cost of the work of the Agricultural Department during the last financial year amounted to 2,600*l.* Of this 1,780*l.* was chargeable to and borne by the local authorities in respect of dairy instruction, extension lectures, experimental stations, and schoolmasters' classes. The fees amounted to 45*l.*, and there were a few small subscriptions.

These foregoing accounts are irrespective of the special account for models, which amounted to 150*l.*, of which sum 100*l.* was met by the Board's grant, the balance falling on the College funds.

SYLLABUS OF EXTENSION LECTURES, COUNTY DURHAM.

SOILS, MANURES, &C.

I.

PLANT FOOD.

Plants, like animals, can live only by virtue of the food supplied to them.

The food of an animal may be in a *solid* as well as liquid condition, whereas plant food must all be either liquid or gaseous.

Sources of Plant Food.—There are two sources through which plants obtain their nutriment:—

(a.) Soil.

(b.) Atmosphere.

Those ingredients of their food which plants derive, by means of their roots, from the *soil*, are of most importance to the farmer; these must all be in a state of solution before they can enter the tissues of the plant.

Substances necessary to the Life of a Plant.—The following substances are supplied by the soil, and are absolutely necessary to the life of every plant, and the absence of any one of them would deprive a soil of fertility:—

(1.) Potash.

(2.) Lime.

(3.) Magnesia.

(4.) Iron.

(5.) Phosphoric acid.

(6.) Sulphuric acid.

(7.) Nitrogen.

The first six represent the incombustible or *ash constituents* of the plant.

Ingredients of Plant Food liable to be lacking in the Soil.

(1.) Nitrogen;

(2.) Phosphoric acid;

(3.) Potash;

and occasionally lime.

It is only under quite exceptional circumstances that the application of other plant foods to the soil is followed by any improvement in the fertility.

Functions of the leaves of a plant.

Functions of the roots of a plant.

II.

MANURES.

A manure is a substance which supplies to plants those ingredients of their food which are liable to be present in insufficient quantities in the soil.

There are many substances which possess a marked fertilising property when applied to the land under suitable conditions, owing to their ameliorating influence upon the *texture* of the soil, irrespective of any plant food they may also supply at the same time.

Such materials are:—

Clay.

Marl.

Chalk and lime, &c.

CLASSIFICATION OF MANURES.

Manures may be primarily divided into two classes:—

(1.) *General Manures*, including those fertilisers which supply *all the plant foods* that are apt to become deficient in the soil owing to the growth and removal of crops.

A general manure, therefore, should contain a certain proportion each of—

Nitrogen;

Phosphates; and

Potash.

Examples are afforded in—

Farmyard manure;

Guano;

Composts, &c.

(2.) *Special Manures*.—A special manure is one which supplies only one or two particular ingredients of plant food.

Thus we have:—

(a.) Nitrogenous manures, which supply the plant with nitrogen, as—

Nitrate of soda;

Sulphate of ammonia;

together with various *organic* materials, such as:—

Dried blood;

Shoddy, &c.

(b.) Phosphate manures, which supply phosphates, as—

Superphosphate of lime;

Basic slag;

Bones, &c.

(c.) Potash manures, supplying potash, as—

Kainit,

Muriate of potash.

There are many so-called special manures which contain two of the important plant foods, *e.g.*:—

Raw bones and fish guano contain a certain per-centage of nitrogen as well as phosphates.

Coal and wood ashes will contain phosphates and potash, but no nitrogen.

III.

NITRATE OF SODA.

The following are important details regarding this manure:—

(1.) It is a purely nitrogenous manure, therefore must not be expected to benefit a crop if phosphates and potash are lacking in the soil.

(2.) It is a very soluble and quickly acting fertiliser; often termed a *one-crop manure*.

(3.) It should be bought guaranteed "95 % pure;" it will then contain $15\frac{3}{4}\%$ nitrogen, equal to 19 % ammonia.

(4.) It should not be applied unless a crop is actually on the ground to profit by it.

(5.) It is frequently applied in *too heavy dressings*; often 1 cwt. per acre is sufficient, and sometimes half that amount. Unless a very small dressing is used it should be given in *two or more doses*.

(6.) It must be evenly distributed over the surface, and to ensure this it is best mixed with sand, ashes, or salt.

Crops suitable for Nitrate.—Nitrate of soda will benefit any crop when there is an insufficient supply of *available nitrogen* in the soil.

It has shown itself especially useful for *cereal crops*, wheat in particular.

Sometimes it will exert a marked influence upon root crops, particularly when only a moderate dressing of farmyard manure has been used.

Mangel wurzel respond readily to an application of nitrate, and for this crop a heavier dressing is usually required than for other crops.

Nitrate of soda for grass-land.

Time of Application.—For wheat and other cereals about March, April, and May, in two or three instalments.

For root crops the first dressing should be given when the plants are just singled out.

Effects of Over-dressing :—

(1.) Corn crops grow an excess of straw and foliage at the expense of the sample; root crops are produced with a larger proportion of water and less solid matter.

(2.) An increased tendency to "mildew" in corn crops.

(3.) Great loss of valuable fertilising matter in the drainage.

IV,

SULPHATE OF AMMONIA.

This fertiliser is obtained at the present time, from several sources, but the major portion is manufactured from the ammonia liquor, a bye-product of the gas-works.

The following are important points respecting this manure:—

(1.) Like nitrate of soda it is purely a nitrogenous fertiliser, though scarcely so rapid in its action, because it has to be transformed into a nitrate before it becomes available.

(2.) It is rather more concentrated in nature than nitrate of soda. It should be bought upon guarantee to contain "*not less than 24 % Ammonia*," equal to about 1 % nitrogen. 112 lbs. sulphate of ammonia is equal in strength to 140 lbs. nitrate of soda.

(3.) It may be mixed with superphosphate without any loss of valuable fertilising matter being entailed. It is, therefore, found useful as the nitrogenous ingredient in "*special crop mixtures*."

(4.) It must not be mixed with basic slag, lime ashes, or any material containing lime.

(5.) Appears to be especially valuable upon the heavier classes of soils. Nitrate is more popular on light land, and has the advantage over sulphate of ammonia in very dry seasons.

The following may be taken as examples of other nitrogenous manures containing varying quantities of ammonia, and should be purchased upon guarantee only:—

Soot;

Dried blood;

Woollen refuse, &c.

NITRATE OF POTASH (SALTPETRE).

A very concentrated and valuable fertiliser, though generally too expensive for purchase as manure.

Very rich in nitrogen as well as potash. It contains about:—

$13\frac{1}{2}\%$ of nitrogen;

46 % of potash.

PHOSPHATE MANURES.

Bones.—Although looked upon as a form of applying phosphates to the soil, on account of their richness in *phosphate of lime*, bones must also be considered as nitrogenous fertilisers when used in their natural raw condition, i.e., when the organic matter has not been driven off, partially or entirely, by steaming, boiling, &c. The

following are examples of the different forms in which bones are applied to the land:—

Half-inch bones;
Quarter-inch bones;
Bone dust;
" meal;
" flour;
" ash;
Dissolved bones or bone superphosphate.

These varieties of bone material differ considerably amongst themselves in the two salient points of importance in most phosphatic manures, viz.:—

- (1.) Proportion of fertilising matter contained.
- (2.) Fineness of grinding.

V.

DISSOLVED PHOSPHATIC MANURES.

These manures contain an appreciable quantity of phosphate of lime which has been rendered soluble by treatment with sulphuric acid (oil of vitriol).

This soluble form of phosphate of lime is called monocalcic phosphate or *superphosphate of lime*.

Superphosphates can be manufactured either from bones, when the material is called

Bone superphosphate or dissolved bones,

or from certain mineral deposits (containing varying proportions of phosphate of lime), when the substance is termed

Mineral superphosphate.

Dissolved or vitriolised bones will contain a certain per-centage of—

Nitrogen (reckoned as ammonia);
Soluble phosphates;
Insoluble "

and the manure should be bought specially guaranteed. A particular value per unit is placed upon each of the above heads.

Dissolved Bone Ash.—A manure containing a high per-centage of soluble phosphate but practically no nitrogen.

MINERAL SUPERPHOSPHATES.

These should be bought only upon guarantee, usually "26-28 % soluble," which phrase has a special meaning.

"Precipitated" or "reverted" phosphate.

Circumstances when it is advisable to apply dissolved phosphate to the land.

(1.) Root crops are almost invariably benefited by an addition of available phosphoric acid to the soil.

(2.) Corn crops often require small quantities of available phosphates, especially when an application of nitrogenous manure has caused an increased demand upon the soil for the mineral ingredients.

(3.) Clovers and other leguminous plants respond freely to phosphatic manures.

Pure dissolved bones are made from bones and acids only. There are large quantities of manures made from a mixture of bone and mineral phosphates: these are designated as "*Dissolved bone compounds*" or "*Dissolved bone manures*," which terms also include mixtures of nitrogen, phosphates, and potash manufactured for special purposes.

VI.

BASIC SLAG.

A bye-product of the steel-making industry when phosphatic ores are employed.

It consists of the slag run from the converters used in the Thomas-Gilchrist or *Basic* process of steel making. The charge of the converter comprises a ton of lime in addition to the cast iron, and the lining consists largely of lime. This excess of lime takes up the phosphorous from the iron in the form of phosphate of lime. In the original Bessemer processes the converters were lined with a siliceous lining, which left the phosphorous in the steel.

The following are points of importance respecting this manure:—

- (1.) Like superphosphate, it is purely a phosphatic manure. It is applied in larger quantities than superphosphate, as it does not usually act so quickly; it is, however, considerably richer in phosphoric acid.
- (2.) In purchasing this material it is important—
 - (a.) That a certain per-centage of phosphoric acid be guaranteed.
 - (b.) That a guarantee be given as to the *fineness of grinding*.
- (3.) It must not be mixed with ammonium sulphate, guanos, or other ammoniacal substances on account of the *lime* which it contains. When mixed with superphosphate it causes "*reversion*."
- (4.) It will often be found an excellent manure for worn-out pasture land, and is adapted to peaty, moory, and clay soils.
- (5.) It is better applied in autumn than in spring.
- (6.) Quantity per acre, 4 to 10 cwt.

POTASH MANURES.

As a general rule it is not necessary to apply special potash manures to the soil:—

- (1.) Because most soils are naturally provided with an adequate quantity of potash.
- (2.) Because potash is a constituent of many other fertilisers, as
Farm-yard manure;
Guano, &c.

The following crops, however, may be considered those most benefited by applications of potash:—

Potatoes;
Mangels;
Clovers;
and often root crops.

The principal special potash manures are—
Kainit;
Muriate of potash.

Kainit is a natural salt obtained from beds of crude potash salts found in Germany.

It may be bought guaranteed—
"25 % sulphate of potash,"

equal to 14 % potash.

Quantity per acre, 2 to 5 cwt.

Muriate of Potash.—A very concentrated potash manure.

It contains—

Muriate of potash equal to 52½ % of potash.

VII.

FARMYARD MANURE.

Farmyard manure is a "general" manure containing a certain proportion of all the essential materials of plant food.

Composition of Farmyard Manure.—The important elements of plant food will be found to exist in about the following proportions:—

Nitrogen	-	-	-	·4 to ·75	per cent.
Phosphoric acid	-	-	-	·2 to ·4	"
Potash	-	-	-	·4 to ·75	"

Water will be present to the extent of 70 to 80 per cent.

It is at once seen to be somewhat deficient in phosphoric acid.

Farmyard Manure a very Valuable Manure.—Its quality will be influenced by the following conditions:—

- (1.) Species of animal from which it is produced.
 - (2.) Age and condition of the animals; the manure of a young and growing animal will be poorer in fertilising matter than that of a full-grown, mature one fed on similar food.
- Animals pregnant or in milk will yield manure inferior to that of working or fattening animals.

(3.) Food consumed. The *albuminoid* constituents of the food are those which chiefly influence the quality of the manure.

(4.) *Amount of the liquid matter which is retained.* This last is by far the most important factor upon which the value of the material depends.

If made in boxes or under covered yards, and afterwards preserved carefully, in such a manner that a minimum of liquid may be lost, it will be very much richer than if made in open yards, and, finally, so exposed that a large proportion of the valuable fertilising matter is washed away by rain.

Mechanical Effect of Farmyard Manure.—By reason of its great bulk, and the fact that it is continually undergoing fermentation and yielding carbonic acid gas, its presence in clay soils renders them more open and free-working.

Lasting Effect of Farmyard Manure.—Experiments prove that it has a perceptible influence upon the yield of crops fully 20 years after its application.

Most "artificial" fertilisers will be seen to contrast unfavourably with farmyard manure in this respect.

Cost of farmyard manure.

Farmyard manure upon grass-land.

VIII.

COMPOSTS.

The term compost is given to heaps or accumulations of the various kinds of refuse always to be found upon farms to a greater or less extent.

Compost heaps will be formed of such materials as :—

Weeds collected from the land.
Hedge clippings.
Potato haulm.
Pond and ditch cleanings.
Road scrapings, &c., &c.

The compost is greatly improved by the addition of *lime* in the proportion of 1 ton of lime to every 4 or 5 tons of compost.

After a few months the heap will have decomposed, and will be found especially serviceable in stimulating the growth of grasses and *clovers* upon young pastures.

LIME.

Liming land must be looked upon as a *durable improvement*.

Lime is applied to the land in various forms :—

Limeshells.
Chalk (carbonate of lime).
Gypsum (sulphate of lime).
Gas lime.
Marl.

Also many of our mineral fertilisers contain lime in some form, *e.g.*—

Basic slag.
Superphosphate of lime.

Lime in the form of carbonate of lime (chalk) may be used in large quantities, but slaked lime is a powerful agent and must be applied in smaller doses.

Chalk.

Chalk occurs in 16 counties in England, and is therefore easily obtainable on many farms.

The formation known as the lower chalk yields the best material for applying to the land ; although large quantities are employed from the upper chalk (containing flints).

Quantity per acre.—9 to 16 loads.

Limeshells.

The application of caustic or burnt lime is particularly useful upon—

- (1.) Stiff clay soils, as it improves their texture and renders them more friable.
- (2.) Peaty soils, on account of its action upon vegetable matter. It also sweetens sour soils by combining with the acid substances.
- (3.) Newly reclaimed and freshly drained land.
- (4.) Land which is subject to "clubbing" in root and cabbage crops.

Quantity per acre.—100 bushels = 3 tons (about).

Three tons would represent a light dressing and 9 tons a heavy dressing.

(4.) THE UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

The organisation and development of agricultural education in Central Wales may be said, during the past year, to have proceeded in a satisfactory manner under the auspices and direction of this College.

The staff of the agricultural department of the College, with the formation of which a commencement was last year made by the appointment (in addition to the lecturer on agriculture) of a lecturer on agricultural chemistry, has during the current year been further developed by the appointment of an assistant lecturer on agriculture, whose duties primarily consist in giving instruction to In-College students at the College itself. A lecturer in veterinary subjects has also been appointed.

In addition to the special subjects taught by these lecturers, instruction for agricultural students is available at the hands of the regular staff of the College in biology, botany, geology, physics, and mathematics.

A definite commencement has thus been made with respect to an In-College course, and during the year 4 students have entered for the full term of 2 years; 2 of these students entered in October and the remainder at a subsequent date.

In addition to the foregoing, 2 students received instruction for a limited period.

The local work instituted from this College as a centre, consisted in the first place of—

Dairying.—Three travelling schools for giving instruction in butter making were organised by the College, and classes were held in the counties of Brecon, Pembroke, Carmarthen, Radnor, S.W. Montgomery, Merioneth, and Cardigan.

The work of all 3 schools seems to be well organised and carried on. At each centre visited, a course of 10 days' instruction is given, and not more than 12 pupils are taken. The usual course is for half the class to churn at one period of the day, and the remainder to churn at another period, the whole class meeting together once a day and receiving oral instruction. At certain places, however, especially where the pupils had to travel long distances to the school, they preferred having their instruction concentrated into 5 days, each pupil churning twice a day, rather than having to attend at the school 10 days in succession.

Each school was equipped with 6 churns, butter-workers, &c., and a hand separator. The whole organisation of these schools is in the hands of the agricultural lecturer at the College, who arranges for each place to be visited, frequently opens the course at different centres, and regularly attends at each centre after the 10 days' instruction has been completed, and examines the pupils both orally and in the manual work.

As the result of examination at the end of each course, successful candidates receive an elementary certificate, stating the number of lessons they have received, and that they have satisfied the examiner at the end of the course. The oral examination is based on a somewhat full and detailed syllabus, of which a copy is annexed.

24 I.—EPITOME OF REPORTS ON INSTITUTIONS AIDED.

The number of 10 days' courses held last year in the different counties was as follows :—

Brecon	-	-	-	-	-	6
Pembroke	-	-	-	-	-	4
Carmarthen	-	-	-	-	-	8
Radnor	-	-	-	-	-	3
Montgomery (S.W.)	-	-	-	-	-	2
Merioneth	-	-	-	-	-	2
Cardigan	-	-	-	-	-	4
Total	-	-	-	-	-	29

The total number of pupils who received instruction in the year was 313, of whom 257 attended for the full 10 days' course.

Field Demonstrations.—A few experiments of an elementary kind have during the past year been instituted, but their object was apparently more to suggest to farmers the use of certain manures for their oat and barley crops, rather than to attempt to organise anything definite in the way of demonstration plots under the direction of the College.

Extension Lectures.—These have been conducted by means of the agricultural staff at the College, and have been largely of a pioneer nature, from one to three lectures being given at each centre. An exception to this has existed in the case of Carmarthenshire, where lectures, from 6 to 9 in number, were given at 8 centres. The lectures seem to have been well attended, although it is understood that a difficulty occurs respecting the language, as objection is not infrequently raised on the part of the audience to listen to anything unless it is delivered in Welsh.

The number of lectures given in each county has been as follows :—

Brecon	-	-	18 lectures at	7 centres ; av. attendance	46
Pembroke	-	-	22	14 " " "	67
Carmarthen	-	-	77	15 " " "	46
Radnor	-	-	2	2 " " "	10
Montgomery (S.W.)	9	"	3	3 " " "	138
Merioneth	-	-	8	3 " " "	60
Cardigan	-	-	10	3 " " "	79

Training of Elementary School Teachers.—This has been carried out at the College on Saturdays, the subjects taken having been agriculture and chemistry.

The time spent is divided as follows :—

10.30 to 12.30	-	-	-	Chemical laboratory.
1.0 to 2.0	-	-	-	Lecture on agriculture.
2.0 to 3.0	-	-	-	" chemistry.
3.0 to 4.30	-	-	-	Chemical laboratory.

The number of teachers receiving instruction has been as follows :—

Agriculture	-	-	Number on roll, 8 ; average attendance,	5
Chemistry	-	-	" 19	11
Chemical laboratory	"	"	17	11

The only county contributing anything to the cost of the class is Cardigan, the council of which pays the fees and a portion of the railway fares of the teachers from its district.

The Cost of the Agricultural Department for this year has amounted to a little over 1,200*l.*, and has been met by county council

grants, amounting to 655*l.*, students In-College fees, and other miscellaneous receipts, and the Board's grant.

SYLLABUS OF QUESTIONS FOR THE USE OF PUPILS IN THE TRAVELLING
DAIRY SCHOOLS.

Milking.

Why should the milker's hands and the cow's udder be perfectly clean? Should the cows be milked quickly or slowly, gently or roughly, thoroughly dry or a part of the milk being left in the udder? Should the milk be left for a long time in the cowshed? Give your reasons. What should be done with milk from a cow out of health?

The Dairy.

Why is cleanliness and proper ventilation so essential, and a strong light or bad odours so objectionable in a dairy? Should fish, game, meat, paraffin oil, &c. be allowed in the dairy? Give your reasons. What are the best materials for (1) the floor, (2) the walls and ceiling, (3) the shelves and pans? What is the best arrangement for securing a proper temperature throughout the year, the drainage, and the water supply? What is the best aspect for a dairy in this country?

Cream Raising, &c.

How soon should milk be "set"? Mention various systems of setting milk. State the best way to cleanse milking and setting pans. Why does cream rise quicker in warm than in cold weather? What is the best depth to set in summer?—in winter? When ought cream to be skimmed? Explain what is meant by the principle of a falling temperature in cream raising. What is the mechanical separator, and on what principle does it extract the cream from the milk? What are its advantages in effectiveness, and in quality of cream obtained? Will it give either thick or thin cream as required? If so, do you quicken or slacken its speed? Should there be any difference in the management of the separator in extracting cream from very rich milk, or from very poor milk? If so, state the difference and give the reason. In what size dairy would it pay to use one?

Churns and Churning.

In selecting a churn what characteristics would you require in the wood? and what in its construction? Why should there be no iron or brass inside the churn? How do you specially prepare a new churn before use? Give full details. How do you prepare a churn that is clean? Do you make a difference in your treatment, if it is in a wet or dry state? Why is it necessary in cleansing utensils after churning and butter-making to use (1) cold, then (2) hot, and (3) boiling water? What is the difference in the order of the "washing" (whether hot or cold) used in the preparation before use, &c., and in the cleansing after use? Give your reasons for the difference of treatment. What is it that "brings" the butter? Which is the best for the rapid and effective aggregation of fat globules, concussion or friction? How do you ascertain the temperature of the cream in the churn? How would you raise the temperature of cream in winter and lower it in summer? What effect will a lower or higher temperature have on the churning? What temperature ought cream to be for churning in summer?—in winter? How can the mode of churning affect injuriously the quality and the quantity of the butter produced? Which will churn quicker, thin or thick cream, sweet or sour cream? State exceptions. Why is it necessary to make very thick cream thinner before churning by carefully adding a little clean water? What is the most favourable richness of cream for easy churning? How do you colour the cream, and whether before or after churning? Are there any advantages in colouring the cream? Is the speed of churning at an uniform rate from beginning to the end? Why is the ventilation of the churn necessary? On the first appearance of the butter granules, how would you "aid" their further gathering and hardening? If water were added, what would be the proportion to the cream put into the churn? What is the best temperature of the water to be added in summer, in winter, and why? Why should the speed of the churning be altered after the addition of water? When do you finally stop churning? How do you remove the butter-milk? How and why do you wash the butter in its granular state before it is removed from the churn? How do you slightly salt fresh butter? Why can you not effectively "brine" over-churned butter? What is the proper strength of the brine, and the proportional quantity to

use to the cream put into the churn? How long ought the butter to be left to its action? How should the butter be lifted from the churn?

Dry-salting and Working the Butter.

In dry-salting what proportion of salt ought to be used, (1) for the London market, (2) for the manufacturing districts, and (3) for keeping or cured butter? How would an irregular distribution of the salt in the butter injuriously affect the quality? What are the causes of white specks and streaks in butter? What is the best salt for the dairy? What are the objections to the hand coming in contact with the butter? What are the chief advantages of the butter-worker? What precaution ought to be taken in using the butter-worker? How long should you continue to work the butter? How would the quality of butter be effected (1) by its being over-worked, and (2) by its being under-worked? Why should the butter be left to solidify (if in a soft state) in a cool place before being finally worked on the butter-worker? What is the most convenient form or "mould" for the butter to be made up for packing conveniently? What is the best wrapper for the forms? How would you protect the butter from bad odours from the wood used for packing? State what difference should be made in the ripening of the cream, and in the salting and working of the butter intended for keeping. What precautions should be taken in filling the jar or cask, and its final covering, so as to reduce the deteriorating action of the atmosphere to a minimum? What are the properties or "points" of good butter.

(5.) THE CAMBRIDGE AND COUNTIES AGRICULTURAL
EDUCATION COMMITTEE.

A good start has been made with this scheme during the latter part of the financial year, students having been regularly received at the beginning of last Lent term.

The scheme is under the management of a committee, consisting of representatives from contributory county councils, together with certain members of the University, but it is not yet officially under the direction of the latter body. Those students, however, who are not themselves members of any college, have to conform to the same rules as undergraduates. It is a pleasing thing to note that several of those who came as unattached students, either have now joined or are likely to join some college, while the character all have earned for good behaviour is satisfactory.

The instruction given in last financial year comprised—

Chemistry (elementary).
Botany (elementary and systematic).
Geology.
Surveying and Mensuration.
Physics.

This will be extended to more advanced instruction in the current year, and also, so far as funds admit, to instruction in other sciences bearing upon agriculture, so that a very thorough course may be looked for here. The system of instruction which is being adopted is to take the pure sciences the first year, and their application to agriculture in the second year; the full scheme as revised up to 30th March is given in the Appendix.

In addition to the instruction already mentioned, agricultural students have the privilege of going on to certain farms in the neighbourhood, and there acquiring knowledge of a more directly practical character.

The number of students forming the present agricultural class is 10, of whom 4 come with scholarships from the Leicestershire County Council, and 1 is sent with a scholarship from each of the following councils, viz., Northamptonshire, Norfolk, Cambridgeshire, and Isle of Ely. Since the scheme has been started 1 or 2 more students have desired to join the class, but it has been thought desirable not to admit them till the October term.

Of the above 10 students, 5 are now members of the University, and 1 is expected to become a member next October; it is anticipated that at least 2 will endeavour to obtain a degree, the examination to which they will probably subject themselves being the first part of the Natural Science Tripos.

The cost of the scheme for the small portion of the past financial year during which instruction was given has been defrayed by a grant of 100*l.* from the Cambridgeshire County Council and the Board's grant.

The annual sums promised in the future by county councils in support of the scheme at present amount to 555*l.*

The councils making these contributions are those for Cambridgeshire, Isle of Ely, Huntingdonshire, West Suffolk, Northamptonshire, Leicestershire, Norfolk, Essex; while almost all have offered scholarships in connection therewith.

Altogether, the scheme may be looked upon as having been launched in an eminently satisfactory manner, and one which, if drawn into close relationship with the University, as there is every reason to hope will be the case, should afford much promise for the future, not only for those who may be intending to follow agriculture as their business, but for that numerous class of men always to be found at the University, who will, in the regular course of events, succeed to the possession of landed estates. For those, too, who may desire to specialise in any particular branch of science bearing upon agriculture, with a view of ultimately taking up the position of teachers, this scheme has possibilities which cannot readily be overestimated.

CAMBRIDGE AND COUNTIES AGRICULTURAL EDUCATION.

CAMBRIDGE, MARCH 30TH, 1893.

A course of Scientific Instruction in subjects bearing upon Agriculture has been organised at Cambridge.

The instruction is in the following subjects :—

Agriculture. Chemistry, elementary and agricultural. Botany, elementary and agricultural. Physiology. Geology. Economic Entomology. Book-keeping. Mensuration and Surveying. Agricultural Engineering.

Opportunities are offered for the study of Veterinary Science, and may be for that of Agricultural Law.

Certain professors and teachers in the University admit to their lectures, and to their practical instruction, in their laboratories, students, not members of the University, under the following conditions :—

That the students are not under 17 years of age. That the students give satisfactory evidence that they have received a sufficient previous education to enable them to take advantage of the proposed instruction.

That from outside sources an annual contribution be provided towards the stipend of teachers, and other necessary expenses.

In aid of the above objects the Cambridgeshire County Council voted 300*l.* for the preliminary expenses, and 100*l.* a year for the subsequent working of the scheme. Other county councils have voted money for it as follows :—

	£
Isle of Ely	100 a year.
Huntingdonshire	50 "
West Suffolk	50 "
Norfolk	55 "
Northamptonshire	50 "
Leicestershire	50 "
Essex	100 "

In addition to the above a grant of 100*l.* has been made by the Board of Agriculture towards the expenses of the present financial year.

Besides the above-mentioned subsidies for the payment of teachers and other working expenses, the county councils have offered scholarships to promising young men desiring to take the course, as follows :—

Cambridgeshire, various scholarships, up to 30*l.* a year.
Huntingdonshire, number and amount not decided at present.
Northamptonshire, two of 25*l.* a year.
Leicestershire, four of 30*l.* a year.
Norfolk, 20 of 50*l.*, some tenable at Cambridge.
Essex, number not decided, of 50*l.* a year.

Students should commence their studies in the Michaelmas term.

The Course will extend over two years, and consist of two parts :—

1. Elementary Science, principally, to be taken in the first year. Chemistry, Physics, Botany, Geology, Mensuration, and Surveying.
2. Special applications of Science to Agriculture, to be taken in the second year. Agricultural Chemistry; Agriculture with field lectures; Physiology; Geology; Botany; Vegetable Pests; Economic Entomology; Engineering; Book-keeping; Agricultural Law; and Veterinary Science.

The course of instruction may be reckoned to occupy about half of each year, and those intending to become farmers will have the other half in which to learn the practice of farming.

It is estimated that any student for the WHOLE course will have to pay, the first year 19*l.* 19*s.*, and the second 18*l.* 18*s.*, in fees; and that for board and lodging the cost will be, if the student desires to be economical, from 6*l.* to 8*l.* a term; so that the necessary expense will be from 38*l.* to 44*l.* per annum for the WHOLE course.

Students from non-contributing counties will have to pay double fees.

It is known that some gentlemen in the neighbourhood of Cambridge will give the students the privilege of walking over and inspecting their farms, and that they will try some experiments for their own and the students' benefit. Permission has been obtained for the students to examine and study the experiments conducted at the farm at Woburn by the Royal Agricultural Society of England, and at the experiment stations of the West Suffolk County Council.

A Common Room has been secured for the students; and a library of standard works and geological maps, &c. is being formed for their use.

It is hoped that, in a short time, the University will sanction an examination in connection with the Course, and that it will grant a diploma to successful candidates.

The students are under general supervision and control, securing good conduct and regular attendance at the lectures.

(6.) THE BATH AND WEST OF ENGLAND SOCIETY.

The educational work of this society during the past year has consisted, as before, of travelling dairy schools; the fixed cheese school, at which also research into the question of Cheddar cheese-making has been carried out; and crop experiments.

Travelling Dairy Schools.—Schools for instruction in butter-making were conducted in the following counties :—

Somersetshire.—10 centres were visited; 2 courses of 10 days each were given at 8 of these centres, and 3 courses at the remaining 2 centres. In all 253 pupils came under instruction, of whom no less than 218 took the full 10 days' course; the remainder (35) received instruction for 1 week or under.

Dorsetshire.—A butter school was opened in this county in August last. Since then 8 centres have been visited. Single courses of 10 days each were given at 4 centres, and double courses of equal length at a similar number of centres. 122 pupils took the full course of 10 days, and 11 came for lesser periods.

Kent.—Instruction by means of a travelling school has been given in this county throughout the year. 11 centres were visited. Single courses of 10 days each were given at 7 centres; at 1 centre there was a second course given, and at 3 centres a third course. The number of persons who took the full course was 138, while 37 attended for a week or less.

Glamorganshire.—A travelling school visited this county in the early part of the year. Instruction was given at 7 centres, at 2 of which a second course was held. There were 66 pupils, each one of whom took the full 10 days' course.

A summary of the foregoing figures shows that during the year 36 centres were visited by the society's butter schools, while the total number of 10 days' courses held at these was 61. The total number of pupils coming under instruction was 637, of whom 544 took the full 10 days' course.

It may be useful also to mention that up to 31st December last the number of centres visited since 1888 by one of the society's travelling schools has been 66, and the number of 10 days' courses held has been 110. The total number of pupils trained has been 1,331, of whom 1,058 received instruction for 10 days each, and 273 for lesser periods, thus forming a record of good work done on the part of the society which it would not be easy to surpass.

Cheese School.—This was held last year at Compton House Farm, Axbridge. The farm was one of about 150 acres, and some 50 cows were kept in milk. The school was open from 1st April to 31st October, during which period 39 pupils visited it, of whom 14 stayed for 1 month, 5 for a fortnight, and the remaining 20 for lesser periods. 6 of the pupils were sent by the Somersetshire County Council.

The cheese when sold realised, on the average, the satisfactory price of 66s. 3d. per 112 lbs.

Research in respect of Cheddar Cheese-making.*—This was again conducted under the direction of Mr. F. J. Lloyd, F.C.S., &c., but had the merit (over the previous year) of being conducted for the whole

* See Section IV. of Appendix, page 131.

time for which the school was open, while a small outbuilding was available for the purposes of a laboratory. An assistant to Mr. Lloyd remained in charge during the whole time.

Full records of all the observations made are given in the society's journal, and these cannot fail to be of great use as forming standards of reference for the future, although it must be admitted that the deductions to be drawn from them at the present are but small. Everything, however, points to the necessity each cheese-maker is under, if deleterious organisms and noxious taints are to be avoided, of exercising the greatest possible care in maintaining the dairy and its surroundings in the most scrupulous state of cleanliness.

The general conclusions arrived at from the two years' experiments are, that as the quality of the cheese varies with the quality of the milk, and as the quality of the milk varies with the particular farm, the particular fields on that farm and the season, so the manufacture of the cheese must not be carried on under one fixed immutable rule, but must itself vary according to the varying quality of the raw material used.

Field Experiments.—Of these one was a repetition of an experiment carried on in the previous year, and had as its object the testing of the residual value of the manures used on the mangels in 1891 as shown in the corn crop of 1892. The two other experiments conducted were to ascertain the comparative effect of lime, dissolved bones, bone meal, and basic slag on old pasture, and to ascertain the effect of a top dressing of salt as an addition to nitrate of soda for wheat and barley.

The experiments were carried on in 9 different counties. Those on old pasture were conducted at 13 stations in 3 counties; those on salt at 25 stations in 9 counties. A further report of the results is given in another portion of this report.

The accounts of this Society for the past financial year show that the expenditure in Somersetshire on account of the county council amounted to 970*l.* for the butter schools, and 957*l.* for the cheese school, while 265*l.* was recovered, by way of fees and sale of produce, in respect of the butter schools, and 752*l.* in respect of the cheese school, leaving a net expenditure on the two of 910*l.* In Kent the butter schools have cost 936*l.*; in Glamorganshire they have cost 368*l.*, and in Dorsetshire 554*l.* The larger portion of this expenditure has been recovered from the county councils, on whose behalf the Society has conducted these schools.

As regards expenses in respect of which no county council grants are made, the cheese research has cost 401*l.*, and the crop experiments 268*l.* Towards these the society has made a grant of 400*l.*

(7.) THE EASTERN COUNTIES' DAIRY INSTITUTE.

The work of this Institution last year has materially increased, and it may be said that in each of the eastern counties, except Essex, dairy instruction in one form or another has been afforded by its means.

At the Institute at Akenham, near Ipswich, the total number of pupils who have received instruction in butter-making has amounted to 46.

The greater number of the pupils were sent with scholarships from county councils, for the purpose of obtaining additional instruction to

that which they had already obtained by means of the travelling dairy schools. The actual numbers thus sent were:—

East Suffolk county scholars -	-	-	-	27
Norfolk " " " "	-	-	-	4
Rutland " " " "	-	-	-	3

As was the case in 1891, a class for Cheddar cheese-making was held in July. The class lasted for nearly three weeks, and three students were sent by the Norfolk County Council to it, and two by the East Suffolk Council. Cheese-making took place on 18 days, the amount of milk used being 20 gallons per day. The cheeses when examined in September seemed to be of very fair quality, and were subsequently sold locally at 10*d.* per lb.

The local work has been as follows:—

Norfolk.—Classes of 10 days' duration were held at 9 centres, and one of 5 days at 1 centre. The total number of pupils attending the classes was 196. Of these, 42 attended the full course, and 75 attended for periods of from 5 to 9 days. The instruction consists of 2½ to 3 hours' practical work and about half an hour's oral instruction. The fees for instruction are usually 2*s.* 6*d.* for the course, but are remitted to labourers' wives and daughters, many of whom attend the classes.

East Suffolk.—Classes of 10 days' duration were held at 3 centres. 54 pupils attended the classes, of whom 8 took the full course and 27 attended for periods of from 5 to 9 days. The fees charged by the council were 2*s.* 6*d.* for the course, but were remitted if the pupil remained for the full 10 days.

West Suffolk.—Instruction was begun here after a demonstration had been made at a local show. It was a great success, and eventually classes of 10 days' duration were started, 4 centres being visited. 64 pupils came under instruction, of whom 22 came for 10 days and 28 for periods varying from 5 to 9 days.

Cambridgeshire.—No class instruction was carried on in this county, but demonstrations were held at 2 centres.

Isle of Ely.—The work in this division is carried on through the medium of the school boards, and arrangements cannot be made for holding classes of longer duration than 5 days. Classes of this length were held at 4 centres, one of which had been visited in the previous year. 67 pupils came under instruction, of whom 31 took the full course. The fees charged are usually 2*s.* or 2*s.* 6*d.* for the course, but mostly go in prizes at the end of the class.

Huntingdonshire.—Courses of 10 days each have been held at 2 centres, one of which had been previously visited. The number of pupils was 40, of whom 13 took the full course; 10 pupils attended for periods varying from 5 to 9 days. No fees were charged.

Rutland.—At 2 centres classes of 10 days each were held, while demonstrations and short courses of 4 days each were held at 5 centres. Altogether 54 persons came under instruction, but only 6 took the full 10 days' course, while 10 stopped for periods varying from 5 to 9 days.

Bedfordshire.—Classes of 10 days' duration were held at 6 centres, 2 of which had previously been visited. 99 persons came under instruction: 33 of these took the full course, and an equal number remained under instruction for 5 to 9 days. Demonstrations were given at 2 local shows, at which large numbers of persons were present.

Hertfordshire.—10 days' classes were held at 2 centres, the number of pupils receiving instruction being 29, but none remained for the full period. A demonstration was held at a local show.

In addition to the foregoing work demonstrations extending over 2 days were given in Middlesex (Poplar) for a local charity, and at Ipswich (where they extended over 10 days) at a local exhibition.

The certificates given by the Institute are two-fold, one is a pure attendance certificate given at the end of each of the local classes, and states precisely the number of days on which the pupil attended; the other is one of proficiency, and is given at the Institute after a written examination conducted by 2 outside persons, who have hitherto been the Science Master at Ipswich and the Suffolk County Analyst.

The cost of the educational work of the Institute in respect of dairying for last year was over 1,700*l*. This has been met by county council grants amounting to 1,108*l*.; grants from local educational authorities 83*l*.; grants from agricultural societies 115*l*.; fees at the Institute 43*l*.; and the Board's grant.

(8.) THE BRITISH DAIRY FARMERS' ASSOCIATION.

(DAIRY INSTITUTE.)

During the past year the number of pupils who have attended for instruction at the Institute at Aylesbury has been 74. The average length of attendance has been 6 weeks, some pupils remaining for only 1 week, others for 20 weeks. Many of the pupils who have been received have been sent by county councils, and the Bucks County Council, who, on account of the grant they make to the Association, have the right of a fortnight's free tuition for the pupils they send to the Institute, have, during the past year, sent 30 pupils as against 6 in the year previous. On account of the limited accommodation at the Institute, however, a considerable number of applications for admittance have been refused.

Those who are now engaged as local teachers form, as usual, a fair proportion of the pupils instructed during the year at this Institute.

Examinations were held at the Institute twice during the year, viz., in May and September. At these examinations—

2 candidates received the diploma and silver medal.			
4	"	"	certificates in butter and cheese making.
2	"	"	cheese-making only.
16	"	"	butter-making only.

Outside Work.—During the past year, 3 travelling dairy schools have been organised for county councils.

Hampshire.—14 centres were visited during the year and courses of 10 days' instruction given at them. At 1 centre a second course was held. 160 pupils came under instruction, most of whom attended for the whole of each course. A practical examination was held at the end of each course. The Hants County Council have now organised a travelling dairy school of their own.

Lincolnshire (Lindsey).—10 centres were visited and 2 courses of 1 week each given at each. The number of pupils at each course was limited to 8, and altogether 160 came under instruction, of whom 137 received certificates in butter-making. It is understood that this county council has also taken over the work into its own hands.

Buckinghamshire.—At 7 centres in this county courses of 1 week's instruction have been given, 4 being given at one centre and 3 at another. 88 pupils came under instruction.

In addition to these classes, single demonstrations were given at 26 centres, and 4 demonstrations at one centre.

Examinations, in addition to those carried on at the Institute itself, were conducted at the Gloucester (County Council) Dairy School, where 5 pupils received butter-making certificates and 1 a cheese-making certificate; in Warwickshire, where a butter-making competition was organised for the Technical Education Committee, in which 28 pupils took part; and in Cumberland, where an examination was held for the county council, at Aspatria—certificates of merit in butter-making being awarded to 4 pupils.

As regards expenditure, the cost of the Hants and Lincolnshire travelling schools was borne by their respective county councils, while the Bucks County Council again made a grant to the Association of 300*l.* in respect of work done in that county. The total expenses at the Institute and in examinations amounted to 1,100*l.*, to meet which, in addition to the Board's grant, subscriptions were received amounting to 23*l.*, and a grant of 100*l.* was made by the parent association. Sales of produce realised 342*l.*, and pupils' fees for board and instruction, together with miscellaneous receipts, came to 309*l.*

(9.) THE HORTICULTURAL COLLEGE, SWANLEY.

The Work of this Institution has proceeded on much the same lines as heretofore, but owing to the action of the Kent County Council there have, during the past year, been more pupils than previously.

The number of individual pupils who have been at the College during the past year, including those sent by the Kent County Council, have been 65, viz:—

Resident	-	-	-	45
Non-resident	-	-	-	9
Ladies	-	-	-	11

Of these 19 have left during the year, viz:—

Resident	-	-	-	10
Non-resident	-	-	-	5
Ladies	-	-	-	4

thus there were at the College on 31st March 1893 46 students, viz:—

Resident	-	-	-	35
Non resident	-	-	-	4
Ladies	-	-	-	7

Of those who left during the year, five had been at the College from one to three months, and the rest (14) had been there from one to two years.

The instruction given at the College now comprises—

Botany, theoretical and practical;
Chemistry, " "
Agriculture and Horticulture;
Land Surveying and Mensuration;
Building Construction;
Entomology;
Elementary Mechanics.

The practical Botany is a new departure, and the teacher reports that the class are doing some very fair work. The Kent County Council have given microscopes to all their students.

During the past year 22 individual students passed South Kensington examinations, as under:—

Chemistry, Elementary, 1st class	-	-	3;	2nd class	-	16
Botany	-	-	5;	"	-	9
Principles of Agriculture, Elementary, 1st class	3;	"	-	"	-	12
"	"	Advanced	"	-;	"	3

Besides maintaining scholars at the College, the Kent County Council have made a grant for experiments to be conducted at the College. During the past year these have chiefly taken the form of manurial experiments on strawberries.

(10.) THE GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE.

This College, which may now be said to have fairly established its position as a centre for the purposes of agricultural instruction, has continued to organise such education in concert with the county councils of several of the south-western counties of Scotland.

The teaching given at the College itself has also steadily increased, and comprises instruction in the chief of the sciences relating to agriculture; while, on account of the general development of the work, the College staff has, during the past year, been materially strengthened.

In addition to the subjects previously taught here, a class has been organised for lectures on forestry, and this has been well attended.

The College session lasts from 1st October to 15th July, and the attendance at lectures in all subjects has increased since the previous year, the senior class in agriculture now numbering 19, and the junior 37. A large proportion of students attending the classes are schoolmasters, the classes in agriculture being mainly evening ones. A day class in agriculture is, however, organised, and already a few students avail themselves of it.

The Extension Work conducted by the College in the past year has been as follows:—

Dumfriesshire and Kirkcudbrightshire.—Classes in connection with both of these county councils have been held at Dumfries. These have consisted of—

Junior Agriculture	-	-	-	30 lectures.
" Chemistry	-	-	-	30 "
Senior Agriculture	-	-	-	60 "
" Chemistry	-	-	-	30 "

The number of students on the register as regards these last two subjects is respectively 50 and 56. The members of the classes are almost all of them schoolmasters.

Ten lectures were separately given in the stewartry in connection with that county council at 15 centres, the subjects of the lectures being soils, manures, and feeding stuffs.

Renfrewshire.—Under arrangement with the county council the following lectures have been given:—

Agriculture	-	-	-	30 lectures.
Chemistry	-	-	-	30 "
Agricultural Botany	-	-	-	12 "

In addition to the foregoing, 6 lectures in agricultural chemistry and 6 in veterinary science have been given at 4 centres.

The classes in this county are almost all composed of farmers and farmers' sons, the number on the register being 35.

Perthshire.—Arrangements were made in this county with 3 school boards for a 4 weeks' course of instruction in butter-making. The course comprised demonstrations and practice work, and also lectures delivered by one of the College staff. The local committee supplied accommodation and milk, and the apparatus was supplied by the College.

Lanarkshire.—Short courses of 3 lectures of a pioneer character have been delivered at 4 centres.

Bute and Arran.—Similar courses to the foregoing have been delivered at 1 centre in Bute and 2 in Arran.

Dumbartonshire.—Similar pioneer courses have been given at 3 centres in this county.

Field Experiments.—As mentioned in the previous report, experiments on the manuring of turnips were conducted in 1892 by the College in the counties Ayr, Dumfries, and Kirkcudbright. These experiments were all designed to be of an educational nature, and to assist as far as could be the extension lecture work. A further development of experimental work is projected by the College.

The total cost of the agricultural work of this College exceeds 1,800*l.*, two-thirds being provided from local sources.

(11.) THE UNIVERSITY OF EDINBURGH.

CLASS FOR RURAL SCHOOLMASTERS.

The usual autumn class was held here from the 1st to 26th August 1892. On this occasion the class obtained the recognition of several local authorities, who sent and paid for some of the teachers attending. The subjects of instruction embraced on five days in each week lectures on Agriculture and Chemistry. The Agricultural lectures occupied from 9 to 11 a.m. daily, and the Chemical from 11.30 to 12.30, with two hours of practical work on alternate afternoons, and excursions to farms on Saturday.

The number of schoolmasters who were present was 79. Of these 11 were sent by the county council for Berwickshire, 1 by the county council for Forfarshire, these councils paying at the rate of 8*l.* per man. Two members of the class were sent by school boards, who paid their expenses.

The remaining members of the class were drawn from all parts of Scotland. From Caithness eight schoolmasters attended, six from Ayrshire, five from each of the counties of Aberdeen, Midlothian, and Dumfries, and four from each of the counties of Lanark, Perth, and Stirling, while 13 other counties were represented.

A special examination in the Principles of Agriculture under the Science and Art Department was, as usual, held at the end of the class, and 67 of the members presented themselves for it. Of these only three failed; 37 passed first class, and 27 second class.

FORESTRY CLASS.

The Forestry Class at this University has been again continued. The course now consists of 100 lectures, of which 50 are delivered in

the winter from October to March, and 50 in the summer from May to July.

The total number of students enrolled was 10, of whom it was understood 3 would probably take the full course.

The fees charged were 3*l.* 3*s.* for the complete course, and 2*l.* 2*s.* for each 50 lectures if taken separately.

Endeavours are being continued to form a fund to endow a chair of forestry in the University, and an anonymous gift of 1,000*l.* has been received towards this object, the interest on this sum being available on account of the present lectures. The Highland and Agricultural Society has also resolved to make a grant of 50*l.* a year towards the remuneration of the lecturer, in addition to collecting, in conjunction with the Scottish Arboricultural Society, a sum of about 1,500*l.* in furtherance of the scheme for the future endowment of a chair.

(12.) ROYAL BOTANIC GARDEN, EDINBURGH.

CLASS FOR FORESTERS AND GARDENERS.

By arrangements with the Office of Works and the Regius Keeper of the Gardens, a special class, composed of 44 working foresters and gardeners, received a course of instruction in the Royal Botanic Gardens, Edinburgh, during the winter of 1892-3, under the scheme set out in the following notice:—

COURSE OF INSTRUCTION FOR PRACTICAL FORESTERS AND GARDENERS AT THE ROYAL BOTANIC GARDEN, EDINBURGH.

By arrangement between the Commissioners of Her Majesty's Works and the Board of Agriculture, a course of study in the sciences underlying the practice and in the principles of Forestry and Horticulture will be instituted in the month of October of this year, at the Royal Botanic Garden, Edinburgh, for Practical Foresters and Gardeners.

The curriculum will extend over two and a half years, and will include the following subjects: Chemistry, Physics, Meteorology, Geology, Surveying and Mensuration, Entomology, Botany, Forestry, and Horticulture, and these will be taught practically as far as is possible.

The curriculum will be free of charge to those who are admitted to it.

The times of the classes will be arranged so as not to interfere with the usual hours of labour.

No one will be admitted who has not had at least three years of practical experience in forestry or gardening.

Applicants for admission must submit a recommendation and certificate of character from their employer.

A certain number of men will be employed as members of the working staff of the Royal Botanic Garden, Edinburgh, during the period of the curriculum. Such men will serve under all the regulations in force in the Garden, and will receive the current wages of their grade. Through the co-operation of the nurserymen in Edinburgh arrangements will be made for the employment of others in the nurseries about Edinburgh during the period of the curriculum.

Those who are admitted to the curriculum will be examined from time to time upon the subjects of study, and any one who does not show satisfactory progress may be debarred from continuing the curriculum.

The syllabus proposed lectures should be given in the evenings in the Gardens with practical lecture hall demonstrations, and with outside demonstrations, where possible, in Chemistry, Physics, Surveying, Mensuration, and Botany. The scheme proposed 20 lectures, with 12 on Meteorology, Geology, and Entomology, and 40 on Forestry and Horticulture. Lectures on Chemistry were given by the assistant to the Professor of Chemistry at the University, and on Physics by the assistant to the Professors of Natural Philosophy. The pupil foresters

took active share in the work of the Gardens, or in seven cases in nurseries in the neighbourhood, where places were found for them. The wages obtainable were, it was understood, 17s. per week in the Gardens, and about 2s. 6d. per day in the nurseries, and it has been suggested that county councils and other bodies having the control of the administration of funds which should be allocated to this purpose might, by small grants in the nature of bursaries, aid deserving men who were desirous of obtaining the benefit of the matured education offered by this class.

(13.) THE INCORPORATED EDINBURGH SCHOOL OF AGRICULTURAL SCIENCE.

This Institution has been established to carry on the work of a portion of the extra mural lecturers of Minto House Medical School and the New Veterinary College, Edinburgh, who have been engaged for several years in teaching sciences bearing on agriculture. Under the new constitution certain ordinary and extraordinary members are associated with these gentlemen, and under the licence of the Board of Trade the new body has been incorporated with the above title.

The Association is governed by a body of governors, who appoint an executive committee to carry out the general business.

Public bodies who subscribe or give donations to the funds are entitled to representation on the governing body, and the Edinburgh County Council, having given a donation of 75*l.* to the School, has appointed 2 representatives.

The course is from the beginning of October to the end of March, and consists of—

- 50 lectures in agricultural chemistry and laboratory work.
- 50 „ botany.
- 50 „ veterinary science.
- 12 lessons in book-keeping and accounts.

Agricultural students are also permitted to attend the lectures on general chemistry, of which 100 were given in the session.

The students are mostly of the agricultural class, being sons of farmers or factors. The total number on the register is 16, though all of these do not attend each course of lectures. Most of these students are also attending the agricultural class in the University.

The income of the Association is derived from grants from public bodies and from fees. The former consisted last year of grants from the county councils for Midlothian (70*l.*) and Edinburgh (75*l.*). The fees, which amount to 8*l.* 8s. per student for the entire course, amounted to 135*l.* in the past year.

(14.) THE UNIVERSITY OF ABERDEEN.

Arrangements have been made whereby, with the sanction of the Scottish Universities Commission, the Fordyce Trust, under which a lectureship in agriculture was founded, will be merged among the other Trusts of the Aberdeen University, whose authorities thus become responsible for the agricultural instruction given.

A special autumn class, in supplement of the winter agricultural course for schoolmasters and university students carried on here, was

last year established, by arrangement with the county council of Aberdeen. This class lasted from 5th September to 1st October, and was attended by teachers from the following counties, viz. :—

Aberdeenshire	-	-	-	46
Forfarshire	-	-	-	3
Ross-shire	-	-	-	2
Total	-	-	-	51

Lectures were given at Aberdeen daily (Saturdays excepted) from 11.30 a.m. to 1 p.m., and practical work in the laboratories carried on from 2 to 4 p.m.

The lecturer on agriculture, who organised this course, was assisted in its conduct by the professors of botany, geology, and natural philosophy in the University, who each delivered 3 lectures and conducted 3 practical meetings, the lecturer on agriculture delivering 12 lectures and conducting 10 practical meetings. Certificates were given at the end of the course to those attending the class.

The Aberdeenshire County Council contributed at the rate of 4*l.* per teacher towards the cost of this autumn class. The other councils interested also contributed, but the total contribution from these sources did not entirely meet the expenses of the class.

The regular winter course commenced on 23rd November and ended on 24th December. The number on the register was 51, consisting of—

3rd and 4th year University students	-	-	-	30
Schoolmasters	-	-	-	21

Of the schoolmasters, 5 came from the town of Aberdeen, 12 from Aberdeenshire, and the remainder from the counties of Banff, Kincardine, and Forfar.

Unlike the autumn course, the instruction in this case was given solely by the lecturer on agriculture, and consisted of lectures chiefly dealing with questions of agricultural chemistry on 3 evenings each week, and the conduct of laboratory work on 2 evenings in each week and for 3 hours on Saturday mornings for country students.

(15.) THE SCOTTISH DAIRY INSTITUTE, KILMARNOCK.

This Dairy School, at which instruction is given in both cheese and butter-making, was open from the 1st of April to the end of September.

The pupils are almost entirely of the farming class, and mostly attend for the purpose of improving themselves in the art of Cheddar cheese-making. 381 individual persons came under instruction during the year. The periods of attendance are irregular, varying from 1 day to 6 weeks. Of the pupils 310 came from Ayrshire, 19 from Argyle, 17 from Lanark, and the remainder from Bute, Kincardine, Renfrew, Midlothian, Dumfries, Kirkcudbright, and Wigton, the islands of Arran, Eigg, and Coll, some also attending from England, Holland, and Germany.

The teacher and his assistant make cheese every day, the pupils attending and rendering what help they may be able to do. During the process of cheese-making the teacher gives what explanation of the process may be necessary.

Nearly 10 tons of cheese and 1,000 lbs. of butter were made at the Institute last year.

The work carried on here has been of great benefit to the cheese-makers in the south of Scotland, especially in Ayrshire, in raising the

quality of Scotch Cheddars and enabling the makers to compete successfully with American importations.

Besides instruction at the Institute itself, butter-making instruction has been given by means of a travelling dairy school for the county council of Ayrshire. Between July and September 11 centres were visited, as a rule for 3 days each, and the average daily attendance at the demonstrations was about 25.

II.

Record of Field Experiments aided by the
Board of Agriculture.

II.—RECORD OF FIELD EXPERIMENTS AIDED BY THE BOARD OF AGRICULTURE.

(FROM THE REPORTS OF DIFFERENT EXPERIMENTERS.)

(1.) BATH AND WEST OF ENGLAND SOCIETY.

(MR. C. R. KNOLLYS.)

The field experiments of 1892 were threefold, having for their object:—

- (1.) To ascertain the effect on the succeeding corn crop of the manures used upon the mangold plots of 1891.
- (2.) To ascertain what artificial manures can be used with advantage upon old pasture.
- (3.) To ascertain the effect of salt as an addition to nitrate of soda for top-dressing wheat and barley.

EXPERIMENT No. 1.

This is a repetition of one carried out in 1891, and the results then obtained are now practically confirmed. The experiment was conducted in the same way as in 1891; the corn upon the seven plots comprising the “dunged” series being harvested together, and the corn upon the seven plots comprising the “artificial” series being similarly treated. The results show that, whereas the “artificial” series of plots gave on the average an increased weight per acre of mangolds, amounting to 1 ton 10 cwt. over the “dunged” series, in the succeeding year the tables are turned, and the “dunged” series proves superior to the “artificial” —where wheat was grown, by 5 bushels per acre, where barley was grown, by $2\frac{1}{4}$ bushels per acre, where oats were grown, by $3\frac{1}{2}$ bushels per acre, and where dredge corn was grown, by $6\frac{1}{2}$ bushels per acre.

In four cases, however, all of them where land is well “done,” the “artificial” plots turned out better than the “dunged.” It would be interesting to observe how long they will continue; and, with reference to the rest of the experiments, valuable information could be obtained by noting the duration of the effect of the dung. In several cases the superiority of the “dunged” plots, both in corn and straw, was very marked.

EXPERIMENT No. 2.

The conditions to be observed in connection with Experiment No. 2 were as follows:—

The object of these experiments is to ascertain what artificial manures can be used with advantage in improving the herbage of old pastures.

These experiments being of a tentative character, with a view of ascertaining whether an improved and more complete scheme can be carried out in the future, it is proposed to limit them to four different manures, at a cost in each case of about 1l. per acre, and to plots of half an acre in size.

The experiments are to be tried upon an old pasture which has not been dressed with dung for at least two years, and which will be grazed (not mown) for the next two years.

The manures and the quantities to be used, under the advice of the Society's consulting chemist, Dr. Voelcker, are bone-meal, 3 cwt.

44 II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE.

per acre ; dissolved bones, 3 cwt. per acre ; basic cinder, 10 cwt. per acre ; and lime, 2 tons per acre.
The quantities to be applied to each half-acre plot are of course half the above, and are stated in the diagram.
The following diagram offers a suitable arrangement of the plots, and should, if convenient, be adopted :—

B. BASIC CINDER. 5 Cwt.		
A. BONE-MEAL. 1½ Cwt.	E. NO MANURE.	C. DISSOLVED BONES. 1½ Cwt.
D. LIME. 1 ton.		

The lime should be that ordinarily used in the district for agricultural purposes, and is to be obtained by the experimenter and charged to the Society. The artificial manures will be paid for by the Society and forwarded to the nearest railway station.

The bone-meal, basic cinder, and lime should be applied before the end of 1892. The dissolved bones may be applied either at the same time or during the month of January 1893.

Wooden pegs should be driven in at the centre and corners of each plot.

Although to obtain a thoroughly satisfactory scheme of grass experiments is a matter of profound difficulty, the Committee, after much anxious consideration, decided to start with this small scheme, which, if not of itself productive of great results, may yet teach some lessons and help to clear away some of the difficulties which beset the whole subject.

At some stations no appreciable difference between the plots has, as yet, been observed. But, on the whole, there is sufficient evidence to prove that the basic slag has so far been most successful, producing an herbage which stock have taken to very kindly and grazed much closer than the other plots. The lime plot stands next in favour, but whether this and the two bone plots will improve their position with time remains to be shown.

EXPERIMENT No. 3.

This was suggested by Dr. Voelcker with the object of obtaining a decided answer to the question whether or not the addition of salt to nitrate of soda, as a top-dressing for wheat or barley, is advantageous ; a point on which at present there exists a diversity of opinion.

The following is a reprint of the conditions and instructions under which the experiment was conducted :—

1. *The experiments to be on land of even quality.*
2. *The plots to be half an acre in size and to be arranged and manured as in the accompanying diagram.*
3. *The boundaries of each plot to be clearly marked, so as to ensure a perfect division at harvest.*
4. *The manures to be applied as follows :—*

The mineral superphosphate should be put on at the time, or shortly before, the barley is sown.

Where nitrate of soda is used without salt (Plots B. and E.) it should be put on as a top-dressing, at the discretion of the experimenter, in two separate applications (half each time), with an interval of a few days between the applications.

Where nitrate of soda is used in combination with salt (Plots C. and F.) they should be mixed together and put on as a top-dressing, at the discretion of the experimenter, in two separate applications (half each time), with an interval of a few days between the applications.

The four plots should of course be dressed on the same day.

5. *The dates of sowing and of the application of the top-dressings should be carefully recorded.*

6. *The corn grown on the plots should be threshed as soon as possible after harvest, and the produce, natural weight per bushel, and weight of straw, entered on the form.*

Diagram showing the Arrangement of the Plots and the Quantity of Manure per Acre to be applied.

WHEAT.

A.	B.	C.	D.	E.	F.
No Manure.	1½ cwt. Nitrate of Soda.	1½ cwt. Nitrate of Soda and 3 cwt. Salt.	No Manure.	1½ cwt. Nitrate of Soda.	1½ cwt. Nitrate of Soda and 3 cwt. Salt.

BARLEY.

A.	B.	C.	D.	E.	F.
No Manure.	3 cwt. Mineral Superphos. and 1½ cwt. Nitrate of Soda.	3 cwt. Mineral Superphos., and 1½ cwt. Nitrate of Soda, and 3 cwt. Salt.	No Manure.	3 cwt. Mineral Superphos., and 1½ cwt. Nitrate of Soda.	3 cwt. Mineral Superphos., and 1½ cwt. Nitrate of Soda, and 3 cwt. Salt.

NOTE.—The above quantities are the rate per acre. As the plots will be half an acre in size, half the above quantities will, of course, only be required.

There were, in all, 25 stations at which this experiment was conducted, 12 being on wheat and 13 on barley, and the average produce of the duplicate plots was as follows :—

WHEAT.

Plot.	Manures per Acre.	Head Corn.	Tail Corn.	Straw.
		bus. lb.	bus. lb.	ton cwt. lb.
A	No manure - - - - }	31 21	2 10	1 4 63
D	Ditto - - - - }			
B	1½ cwt. nitrate of soda - }	37 14	2 40	1 7 46
E	Ditto - - - - }			
C	{ 1½ cwt. nitrate of soda - }	37 23	2 37	1 7 47
F	{ 3 cwt. salt - - - - }			
	Ditto - - - - }			

BARLEY.

Plot.	Manures per Acre.	Head Corn.	Tail Corn.	Straw.
		bus. lb.	bus. lb.	ton cwt. lb.
A	No manure - - - - }	39 31	2 43	1 1 108
D	Ditto - - - - }			
B	{ 3 cwt. mineral superphosphate }	45 40	4 3	1 7 26
E	{ 1½ cwt. nitrate of soda - }			
	Ditto - - - - }			
C	{ 3 cwt. mineral superphosphate }	47 29	3 25	1 8 52
F	{ 1½ cwt. nitrate of soda - }			
	{ 3 cwt. salt - - - - }			
	Ditto - - - - }			

It will be observed that where barley was grown, mineral superphosphate has been used. In this the experiments committee acted upon the results of the barley experiments in 1889, which clearly indicated that the use of this manure in connection with nitrate of soda was desirable.

Disappointment may possibly be felt that the difference between the plots with salt and those without is not more clearly marked, particularly with regard to the wheat. But the difference in quantity is perhaps a secondary consideration compared with the difference in quality, both in corn and straw, which the table does not show. As a general rule the salt plots produced a better sample of corn, with decidedly stiffer and stronger straw. In some instances the crop on the plots without salt (though not heavier) was much laid, while that on the salt plots stood up well.

Mr. Ashcroft, a careful observer, and one of the Society's most valued experimenters, says:—"The corn on the unmanured plots was the most uneven of the three samples, and the salt plots have an advantage over the unsalted in colour, evenness, and size of grain by, I should say, quite 2s. per quarter. The salt makes the grain and straw perceptibly whiter. I am convinced, from four years' experience, that it is the right thing to add; and I owe my information to the Bath and West and Southern Counties Society."

When, in addition, the comparatively trifling cost of the salt is borne in mind, there appears to be ample justification, at all events in the case of barley, for an affirmative reply to the question whether or not the addition of salt to nitrate of soda is advantageous.

(2.) THE NORFOLK CHAMBER OF AGRICULTURE.

(Messrs. C. LOUIS BUXTON, B. B. SAPPWELL, and GARRETT TAYLOR.)

These experiments have been extended to three other farms, viz., Sir Humphrey de Trafford's, at Flordon; Major J. E. Groom's, at Warham; and Mr. J. W. Howell's, at Elmham. The land at Flordon is a poor heavy clay soil; at Warham, a thin light soil resting on chalk; at Elmham, a dark soil full of small stones on a peaty sub-soil. The soils of the other farms (Whitlingham, Cawston, and Bolwick) on which experiments have been carried out for several years, are as follows. At Whitlingham, a lightish soil resting on brick earth; at Cawston, a light soil, on a bright building sand; and at Bolwick a deep rich loam.

The experiments carried out were repetitions of former experiments on varieties of wheat, phosphatic manures on swedes, and salt on barley. The manurial experiments upon barley were last year commenced on the heavy clay land at Flordon; as were also competitive experiments with different varieties of barley; the latter were also carried out at Whitlingham and Bolwick. The rotation experiments, to test the value of the unexhausted residue of manures applied to mangold at Whitlingham and Bolwick in the spring of 1890, are still going on.

It will thus be seen that the number of varieties experimented with last year was 9 at Whitlingham and 8 at Cawston. The yield all round was less than the previous year, but the order of merit remained very much the same, confirming the former results.

Carter's "Stand-up," with 48½ bushels per acre, was first for the third time at Whitlingham, and with nearly 40 bushels per acre was second on the list at Cawston; only being beaten by "Square Head's Master," which had not previously been tried at Cawston. "Banham's" again came out well at Whitlingham, and "Hybrid King," which was just level with it in the previous year, last season fell behind. "Hundredfold" and "Holborn Wonder" were only just below Banham's. The yields from the new stock Scholey's "Square Head," and that acclimatised at Whitlingham were practically identical. "Spalding," exactly as in the year before, stood much higher in the list at Cawston than at Whitlingham.

At Whitlingham, all the varieties stood up well except "Spalding," which went down a fortnight before harvest, and in some places was laid quite flat. "Hundredfold" and "Holborn Wonder" were also leaning at harvest time, and the straw was decidedly rusty, both at Cawston and Whitlingham, in fact all the varieties were affected with rust, the white more than the red.

It will be seen from the above, that experiments were last year tried with varieties of barley of a similar nature to those tried in previous years with varieties of wheat. It is curious to note that the relative order of merit of the different varieties, as regards yield, is identical at Whitlingham and Flordon, the yields all through being rather less at the latter place than at the former.

So far as yield is concerned, Archer's was easily first at all three places, but Goldthorpe was a much better sample than any of the other varieties at Whitlingham, Flordon, and Bolwick, for Archer's ripened too late for these districts, having been a week to 10 days after all the other varieties. Taking these facts together, Goldthorpe may be said to have come out best.

At Bolwick the order after the first, "Archer's," was quite different, "Oakshot's" and "Hallett's Pedigree," old stock, came out much better than at the other two places. "Hanna," which was only tried at Whitlingham, came out considerably behind all the other varieties.

COMPETITIVE EXPERIMENTS WITH DIFFERENT VARIETIES OF WHEAT.

Each plot at Whitlingham received 15 loads of dung, 2 cwts. of salt, and $\frac{1}{2}$ cwt. of nitrate of soda per acre; and at Cawston, 10 loads of dung per acre.

Variety of Wheat.	Place of Experiment.	Total Weight.	Description.	Corn per Acre.	Weight per Bushel.	Straw per Acre.
		lbs.		bushs.	lbs.	cwts. qrs. lbs.
Carter's Hundredfold.	Whitlingham	2,979	{ Best	45'53	64'75	31 1 27
			{ Dross	'57	54'59	
	Cawston	2,254	{ Best	34'43	62'75	30 2 10
			{ Dross	1'59	59'00	
Carter's Holborn Wonder	Whitlingham	2,946	{ Best	44'82	65'00	31 2 26
			{ Dross	'60	54'80	
	Cawston	2,402	{ Best	33'10	63'50	31 1 24
			{ Dross	1'33	57'00	
Carter's Stand-up	Whitlingham	3,114	{ Best	48'50	63'25	31 0 16
			{ Dross	1'06	44'50	
	Cawston	2,567	{ Best	39'71	61'87	31 1 6
			{ Dross	1'67	59'00	
Spalding	Whitlingham	2,641	{ Best	41'06	63'37	35 2 5
			{ Dross	'78	51'00	
	Cawston	2,424	{ Best	37'07	62'31	32 1 10
			{ Dross	1'91	60'00	
Webb's Hybrid King	Whitlingham	2,746	{ Best	42'92	62'75	30 3 2
			{ Dross	1'23	43'50	
	Cawston	2,416	{ Best	37'91	61'00	32 0 24
			{ Dross	1'79	58'00	
Bauham's	Whitlingham	3,103	{ Best	46'68	64'25	36 0 13
			{ Dross	2'10	49'50	
	Cawston	2,377	{ Best	36'29	61'87	32 3 16
			{ Dross	2'28	58'00	
Square Head Master	Whitlingham	2,972	{ Best	45'84	64'00	30 3 2
			{ Dross	'78	53'50	
	Cawston	2,677	{ Best	41'79	62'50	32 1 10
			{ Dross	1'17	56'00	
Scholky's Square Head (old stock acclimated at Whitlingham)	Whitlingham	2,827	{ Best	43'65	63'25	28 2 0
			{ Dross	1'43	46'50	
	Cawston	2,482	{ Best	38'53	61'25	30 3 0
			{ Dross	2'07	59'00	
Scholky's Square Head (new stock 1888)	Whitlingham	2,846	{ Best	43'84	63'50	29 1 26
			{ Dross	1'37	46'00	

COMPETITIVE EXPERIMENTS WITH DIFFERENT VARIETIES OF
BARLEY.

At Whitlingham (Park, 20 acres,) the previous crop was mangolds, grown from 12 loads of dung, 3 cwts. of salt, and 2 cwts. of nitrate of soda per acre. At Flordon (Upper Cowshed Piece), the previous crop was mangolds, grown from 15 loads of dung per acre. At Bolwick the previous crop was also mangolds, grown from 10 loads of dung, 3 cwts. of salt, and 1 cwt. of nitrate of soda per acre.

The barley was sown at Whitlingham on April 6th, and at Flordon and Bolwick on April 2nd.

Variety of Barley.	Place of Experiment.	Total Weight.	Description.	Corn per Acre.	Weight per Bushel.	Straw per Acre.
		lbs.		bush.	lbs.	cwts. qrs. lbs.
Hallett's Pedigree (old stock)	Whitlingham	2,194	{ Best Dross	40'87 '48	53'25 37'00	23 1 4
	Bolwick	2,698	{ Best Dross	50'00 '51	53'62 34'00	24 1 25
	Flordon	2,117	{ Best Dross	38'51 '82	54'00 46'00	21 3 6
Hallett's Pedigree (new stock) - 4 pecks seed sown per acre. 6 pecks ditto	Whitlingham	2,761	{ Best Dross	50'93 '28	54'00 41'00	27 1 1
	Whitlingham	2,711	{ Best Dross	50'25 '25	53'75 40'00	26 2 23
	Whitlingham	2,736	{ Best Dross	50'25 '25	54'25 41'00	26 2 24
8 pecks ditto	Whitlingham	2,495	{ Best Dross	46'14 '25	53'87 40'00	25 0 1
12 pecks ditto	Whitlingham	2,474	{ Best Dross	46'65 '39	52'75 35'00	21 3 3
Hallett's Pedigree (new stock)	Bolwick	2,470	{ Best Dross	45'56 '51	53'68 48'00	24 1 4
	Flordon	1,923	{ Best Dross	36'18 '14	53'00 39'00	25 2 24
Hanna	Whitlingham	2,835	{ Best Dross	51'95 '29	54'37 38'00	26 3 9
Goldthorpe	Whitlingham	2,531	{ Best Dross	47'50 '17	52'50 32'00	25 0 0
	Bolwick	2,772	{ Best Dross	50'00 1'03	54'50 46'00	29 1 8
	Flordon	3,109	{ Best Dross	57'36 '29	54'00 42'00	30 0 0
Archer's	Whitlingham	2,913	{ Best Dross	54'62 '56	53'00 33'00	28 1 18
	Bolwick	3,111	{ Best Dross	56'12 '98	51'62 47'00	30 1 7
	Flordon	2,260	{ Best Dross	41'73 '18	54'00 39'00	25 1 19
Webb's Kniver Cheva- her	Whitlingham	2,579	{ Best Dross	48'36 '50	53'00 33'00	23 0 23
	Bolwick	2,121	{ Best Dross	38'68 '43	54'37 42'00	26 3 17
	Flordon	2,582	{ Best Dross	47'64 '25	54'00 39'00	25 1 27
Oakshot's Peerless White	Whitlingham	2,738	{ Best Dross	50'87 '50	53'50 33'00	28 2 23
	Bolwick	2,418	{ Best Dross	44'00 '65	54'25 49'00	25 0 12
	Flordon					

"Hallett's Pedigree," new stock, was sown at Whitlingham on four plots; 4, 6, 8, and 12 pecks being sown to the acre. The yield from the three plots sown with 4, 6, and 8 pecks respectively was almost identical; but the one sown with 12 pecks yielded 4 bushels less, and 2 cwt. less straw.

ROTATION EXPERIMENTS.

The experiments have now advanced to the following stage:—

WHITLINGHAM.

No. of Plot.	Manures per Acre.	Mangolds 1890.	Barley 1891.	Seeds 1892.
			Bushels.	Tons cwt.
1 & 6	$\left\{ \begin{array}{l} 2 \text{ cwt. fish salt} \quad - \quad - \\ 1 \text{ cwt. nitrate of soda as} \\ \text{top dressing} \quad - \quad - \end{array} \right\}$	No results	$\left\{ \begin{array}{l} 44.00 \\ 46.48 \end{array} \right\}$	$\left\{ \begin{array}{l} 6 \quad 1 \\ 6 \quad 5 \end{array} \right\}$
2 & 6	$\left\{ \begin{array}{l} 20 \text{ loads dung} \quad - \quad - \\ 2 \text{ cwt. fish salt} \quad - \quad - \\ 1 \text{ cwt. nitrate of soda as} \\ \text{top dressing} \quad - \quad - \end{array} \right\}$	No results	$\left\{ \begin{array}{l} 54.6 \\ 56.6 \end{array} \right\}$	$\left\{ \begin{array}{l} 6 \quad 9 \\ 7 \quad 9 \end{array} \right\}$
3 & 4	$\left\{ \begin{array}{l} 10 \text{ loads dung} \quad - \quad - \\ 2 \text{ cwt. fish salt} \quad - \quad - \\ 1 \text{ cwt. nitrate of soda as} \\ \text{top dressing} \quad - \quad - \end{array} \right\}$	No results	$\left\{ \begin{array}{l} 51.7 \\ 52.1 \end{array} \right\}$	$\left\{ \begin{array}{l} 8 \quad 14 \\ 7 \quad 7 \end{array} \right\}$

BOLWICK.

No. of Plot.	Manures per Acre.	Mangolds 1890.	Barley 1891.	Seeds 1892.
		Tons cwt.	Bushels.	Tons cwt.
1 & 6	$\left\{ \begin{array}{l} 2 \text{ cwt. fish salt} \quad - \quad - \\ 1 \text{ cwt. nitrate of soda as} \\ \text{top dressing} \quad - \quad - \end{array} \right\}$	$\left\{ \begin{array}{l} 16 \quad 0 \\ 16 \quad 10 \end{array} \right\}$	$\left\{ \begin{array}{l} 39.2 \\ 33.12 \end{array} \right\}$	$\left\{ \begin{array}{l} 6 \quad 12 \\ 5 \quad 3 \end{array} \right\}$
2 & 5	$\left\{ \begin{array}{l} 20 \text{ loads dung} \quad - \quad - \\ 2 \text{ cwt. fish salt} \quad - \quad - \\ 1 \text{ cwt. nitrate of soda as} \\ \text{top dressing} \quad - \quad - \end{array} \right\}$	$\left\{ \begin{array}{l} 18 \quad 16 \\ 18 \quad 18 \end{array} \right\}$	$\left\{ \begin{array}{l} 42.0 \\ 38.91 \end{array} \right\}$	$\left\{ \begin{array}{l} 7 \quad 11 \\ 7 \quad 3 \end{array} \right\}$
3 & 4	$\left\{ \begin{array}{l} 10 \text{ loads dung} \quad - \quad - \\ 2 \text{ cwt. fish salt} \quad - \quad - \\ 1 \text{ cwt. nitrate of soda as} \\ \text{top dressing} \quad - \quad - \end{array} \right\}$	$\left\{ \begin{array}{l} 17 \quad 19 \\ 17 \quad 11 \end{array} \right\}$	$\left\{ \begin{array}{l} 38.8 \\ 37.57 \end{array} \right\}$	$\left\{ \begin{array}{l} 6 \quad 15 \\ 6 \quad 18 \end{array} \right\}$

At Whitlingham the plant of red clover was very irregular, and it was impossible to select a uniform piece from each plot for estimating.

At both Whitlingham and Bolwick in 1891 the second crop, barley, was better on the plot which had received 10 loads of dung than on that which had received no dung, and was best of all on the 20 load plot; but the increase was small compared with the manure producing it. Last year at Whitlingham, the results, which were not very trustworthy for the reason stated above, indicated a decreasing effect from the dung. The plot which had 10 loads, had, taking the average, $1\frac{1}{2}$ tons, and the 20 load plot only $\frac{3}{4}$ of a ton more than the "no dung" plot. The smaller yield on the 20 load plot can only be due to the irregularity of the plant, a heavy crop of barley often smothering and destroying part of the leys; but taking both together, the application

of dung to the mangolds in 1890 seems to have produced only a very slight effect on the seeds of last year.

At Bolwick, where no red clover was sown, the results are more uniform—the 20 load plot has been the best throughout; but it has only beaten the “no dung” plot by 2 tons of mangolds, 8 bushels of barley, and $1\frac{1}{2}$ tons of grass. The 10 ton plot has beaten the “no dung” plot by rather over a ton of mangolds, 5 bushels of barley, and 1 ton of grass.

Here, therefore, up to last year, the dung applied to the mangolds in 1890 has continued to produce a distinct effect; but, as in the case of the experiments carried out at Whitlingham in 1896, 7, 8, and 9, the effect has only been very small.

EXPERIMENTS UPON BARLEY TO TEST THE VALUE OF SALT.

At Whitlingham (Park 20 acres) the previous crop was mangolds, grown from 12 loads dung, 3 cwts. salt, and 2 cwts. nitrate of soda per acre. (Park 22 acres) the previous crop was swedes, all folded on the land by fattening sheep.

At Bolwick (Man's Field) the previous crop was mangolds, grown from 10 loads dung, 3 cwts. salt, and 1 cwt. nitrate soda per acre. (Box Piece) the previous crop was swedes, grown from 10 loads dung, all folded on the land by fattening sheep, eating $\frac{1}{2}$ lb. cake per head per day.

WHITLINGHAM FARM (PARK, 20 ACRES).

No. of Plot.	Salt per Acre.	Total Weight.	Description.	Corn per Acre.	Weight per Bushel.	Straw per Acre.
		Lbs.		Bushels.	Lbs.	Cwts. qrs. lbs.
1	3 cwts. salt	2,903	Best	50.46	55.25	27 2 10
			Dross	39	39.00	
2	Nothing	2,233	Best	40.78	55.00	20 2 24
			Dross	31	39.00	

WHITLINGHAM FARM (PARK, 22 ACRES).

No. of Plot.	Salt per Acre.	Total Weight.	Description.	Corn per Acre.	Weight per Bushel.	Straw per Acre.
		Lbs.		Bushels.	Lbs.	Cwts. qrs. lbs.
1	3 cwts. salt	2,912	Best	53.50	55.00	29 0 22
			Dross	62	40.00	
2	Nothing	2,835	Best	51.40	55.00	29 3 18
			Dross	70	40.00	

BOLWICK FARM (MAN'S FIELD).

No. of Plot.	Salt per Acre.	Total Weight.	Description.	Corn per Acre.	Weight per Bushel.	Straw per Acre.
		Lbs.		Bushels.	Lbs.	Cwts. qrs. lbs.
1	3 cwts. salt	2,927	Best	53.04	54.75	29 2 26
			Dross	62	38.00	
2	Nothing	2,806	Best	53.28	55.87	30 3 26
			Dross	70	40.00	

BOLWICK FARM (BOX PIECE).

No. of Plot.	Salt per Acre.	Total Weight.	Description.	Corn per Acre.	Weight per Bushel.	Straw per Acre.
		Lbs.		Bushels.	Lbs.	Cwts. qrs. lbs.
1	3 cwt. salt - - -	2,647	{ Best -	48'59	54'25	26 2 22
			{ Dross -	31	38'00	
2	Nothing - - -	2,731	{ Best -	50'15	54'00	28 2 8
			{ Dross -	62	38'00	

The above experiments to test the value of salt when applied to barley were of the same uncertain nature as in 1891. At Whitlingham, in the Park (20 acres), where the last crop was mangolds, the addition of 3 cwt. salt per acre produced an increase of 10 bushels per acre. It is singular that the only instance where salt produced an increase in the previous year was when the barley was grown after mangolds.

In the Park (22 acres) after swedes, all folded on the land, the salt produced an increase of less than 1 bushel per acre, and in both the plots at Bolwick the crop was rather less on the salt plots than on the land receiving no salt. The salt, too, seems to have had no effect in preventing the crop going down, for at Bolwick both the salt plots were badly laid.

Park (20 acres) is lighter land than Park (22 acres).

MANURIAL EXPERIMENTS UPON BARLEY AFTER MANGOLDS.

The mangolds were manured with 15 loads dung per acre.

The two plots receiving no manure varied very widely, one yielding nearly 35 and the other only 26 bushels per acre, while the plot receiving salt alone (3 cwt.) yielded 41 bushels.

Taking 30 bushels as the average on the nothing plots, the minerals (2 cwt. superphosphate and 1 cwt. muriate of potash) alone gave a very small increase in the yield, only $2\frac{1}{2}$ bushels, while the nitrate alone gave an increase of nearly 9 bushels.

This again shows that barley does not require any special addition of mineral manures, those applied to the other crops in the ordinary course of the rotation being sufficient for it. On the other hand, it is largely benefited by the direct application of nitrate of soda, or some form of soluble nitrogen.

The addition of 3 cwt. of salt to the $1\frac{1}{2}$ cwt. of nitrate of soda did not improve the crop, and the barley on the plot to which it was applied did not stand so well as that receiving nitrate alone.

In every case where more than 1 cwt. of either nitrate of soda or sulphate of ammonia was applied the crop went down more or less, and on the plots receiving 2 cwt. of nitrate, or the equivalent $1\frac{1}{2}$ cwt. of sulphate of ammonia, the barley was badly laid, nor did these larger dressings produce any considerable increase in the crop.

This shows the liability of soluble nitrogen to cause crops to go down, especially on strong land.

The plots receiving nitrogen gave in every case more straw than either the nothing plots, or those receiving minerals alone.

EXPERIMENTS UPON SWEDES TO DETERMINE THE VALUE
OF PHOSPHATIC MANURES IN DIFFERENT FORMS.

The experiments to determine the value of different forms of phosphatic manures when applied to swedes were, with a slight alteration, last year repeated for the fourth time, and the results confirmed those of former years to a great extent.

Taking the results all round, superphosphate has come out just about equal to bone compound and dissolved bones, and taking into consideration that phosphates can be bought cheaper per unit as superphosphates, than in any of the bone preparations, the conclusion must be again arrived at here that superphosphate is the most profitable form in which phosphatic manure can be applied to swedes. The phosphate it contains is both cheap and soluble, and bone phosphates do not seem to have any advantage over it.

Basic slag seems to have given a better account of itself last year than before. On one of the plots at Whitlingham, it gave a ton more swedes than anything else; but on one of the plots at Flordon it gave no increase at all over the nothing plots.

On the peaty land at Elmham it gave results quite as good as any of the other manures; but much stress cannot be laid on this, as there was so little difference between the plots there.

(3.) UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

(a.) THIRD REPORT ON MANURIAL EXPERIMENTS ON PASTURE LAND,
carried out at CHIRBURY, near MONTGOMERY.

(Mr. DOUGLAS A. GILCHRIST).

These experiments have now been carried on for three years on a farm owned by the Earl of Powis, and which is occupied by Mr. E. H. Morris, who has placed the land at the disposal of the College, and has also provided the various manures. When the land was put under experiment in 1890 it was in exceedingly poor condition, and had been under pasture for about 15 years. The soil is a stiff sour clay, and the subsoil is hard and retentive. Prior to 1890 the herbage on the field was coarse and scanty, and the field had not been manured for a considerable time.

The results over the three years have been tabulated on Tables A., B., and C. Practically three distinct sets of experiments have been carried out during the past season. On Table A. the results are given of the plots which were manured with the various manures in the spring of 1890, but were not manured during seasons 1891 or 1892. This table, therefore, shows the effects of the various manures during the first, second, and third seasons after application.

TABLE A.

No. of Plot.	Manures per Acre applied, 1890.	Cost per Acre.	Weight of Hay per Acre, 1890.	Weight of Hay per Acre, 1891.	Weight of Hay per Acre, 1892.
		£ s. d.	T. cwt. lbs.	T. cwt. lbs.	T. cwt. lbs.
1a	Basic slag (best quality) - 2 0	1 0 1	1 17 93	1 5 80	0 18 40
	Superphosphate - - 1 28				
	Nitrate of soda - - 1 0				
	Kainit - - - 1 0				
2a	Basic slag (best quality) - 3 0	0 18 3	1 15 8	1 7 76	1 1 72
	Nitrate of soda - - 1 0				
	Kainit - - - 1 0				
3a	Superphosphate - - 3 84	1 4 2	1 17 76	1 5 44	0 18 40
	Nitrate of soda - - 1 0				
	Kainit - - - 1 0				
4a	Dissolved bones - - 4 0	1 7 6	1 8 43	1 9 64	1 2 40
5a	Basic slag (best quality) - 1 94	1 2 8	1 13 46	1 7 52	1 1 23
	Superphosphate - - 3 8				
	Nitrate of soda - - 0 92				
6a	Lime (5 tons) - - -	2 10 0	1 1 24	1 3 16	0 18 64
7a	No manure - - -	—	0 19 54	1 1 24	1 0 100
8a	Bone meal - - - 4 0	1 8 0	1 1 28	1 10 44	1 4 100
9a	Superphosphate - - 3 84	0 11 11	1 4 96	1 10 60	0 18 72
10a	Basic slag (inferior quality) - 6 0	0 9 6	1 2 72	1 6 28	0 16 72
11a	Basic slag (best quality) - 3 0	0 6 0	1 8 36	1 7 72	0 17 52
12a	No manure - - -	—	0 18 108	1 0 56	0 16 60

TABLE B.

The Manures applied to these plots in 1890 are given in Table A.

No. of Plot.	Manures per Acre applied, 1891.	Cost per Acre, 1891.	Weight of Hay per Acre, 1891.	Weight of Hay per Acre, 1892.
	cwt. lbs.	£ s. d.	T. cwt. lbs.	T. cwt. lbs.
1b	{ Basic slag (best quality) 2 0 Superphosphate - 1 28 Nitrate of soda - 1 0 Kainit - 1 0	0 19 9	1 16 54	0 19 32
2b	{ Basic slag (best quality) 3 0 Nitrate of soda - 1 0 Kainit - 1 0	0 17 9	2 2 68	1 3 0
3b	{ Superphosphate - 3 84 Nitrate of soda - 1 0 Kainit - 1 0	1 3 9	2 3 28	1 0 16
4b	Dissolved bones - 4 0	1 3 0	1 18 100	1 8 0
5b	{ Basic slag (best quality) 2 67 Superphosphate - 2 0 Nitrate of soda - 0 88	0 18 7	2 1 80	1 4 64
6b	16 tons farmyard manure - -	4 0 0	1 8 60	1 12 32
7b	{ Superphosphate - 1 0 Basic slag (best quality) 2 0 Nitrate of soda - 1 0 Kainit - 2 0	1 1 8½	1 11 20	1 2 16
8b	Bone meal - - 4 0	1 11 0	1 11 4	1 5 60
9b	Superphosphate - 3 84	1 12 0	1 16 28	1 0 80
10b	16 tons farmyard manure -	4 0 0	1 10 96	1 2 32
11b	Basic slag (best quality) 3 0	0 6 0	1 11 20	1 1 96
12b	{ Superphosphate - 1 0 Basic slag (best quality) 2 0 Nitrate of soda - 1 0	0 16 2	1 9 108	0 18 80
13b	(New plot) 16 tons farmyard manure -	4 0 0	1 11 76	1 9 48
14b	{ (New plot) superphosphate - 4 0 Nitrate of soda - 1 0	1 1 10	1 16 108	1 6 16

TABLE C.

The manures applied to these plots in 1890 are given in Table A., those applied in 1891 are given in Table B.

No. of Plot.	Manures per Acre applied, 1892.	Cost per Acre, 1892.	Weight of Hay per Acre, 1892.
	cwt. lbs.	£ s. d.	T. cwt. lbs.
1c	Basic slag (best quality) - 2 0 Superphosphate - 1 28 Nitrate of soda - 1 0 Kainit - 1 0	1 1 8½	1 9 0
2c	Basic slag (best quality) - 3 0 Nitrate of soda - 1 0 Kainit - 1 0	1 0 0	1 8 0
3c	Superphosphate - 3 84 Nitrate of soda - 1 0 Kainit - 1 0	1 5 3	1 8 32
4c	Dissolved bones - 4 0	1 3 6	1 12 32
5c	Basic slag (best quality) - 2 0 Superphosphate - 3 0 Nitrate of soda - 0 72	1 0 1½	1 13 16
6c	Nitrate of soda - 1 0 Basic slag (best quality) - 3 0	0 17 0	1 18 32
6d	Nitrate of soda - 1 0 Basic slag (best quality) - 3 0	0 17 0	1 6 0
7c	Superphosphate - 1 0 Basic slag (best quality) - 2 0 Nitrate of soda - 1 0 Kainit - 2 0	1 3 11½	1 10 48
8c	No manure - - -	—	1 5 360
9c	Superphosphate - 3 84	0 11 9	1 2 96
10c	Nitrate of soda - 1 0	0 10 6	1 9 64
11c	Basic slag (best quality) - 3 0	0 6 6	1 4 80
12c	Superphosphate - 1 0 Basic slag (best quality) - 2 0 Nitrate of soda - 1 0	0 18 0	1 5 64
13c	Nitrate of soda - 1 0 Basic slag (best quality) - 3 0	0 17 0	2 0 0
14c	Superphosphate - 4 0 Nitrate of soda - 1 0	1 3 0	1 15 0
15c	Nitrate of soda - 1 0	0 10 6	1 3 0

Table B. gives the results on the plots which were manured during the seasons 1890 and 1891, but not during season 1892; while Table C. shows the results on the plots that were manured during each of the seasons 1890, 1891, and 1892.

In these experiments all the principal manures which are applied to pasture land have been compared with each other, viz.:—Lime, farmyard manure, phosphatic manures (bone meal, dissolved bones, superphosphate, and basic slag), a nitrogenous manure (nitrate of soda), and a potash manure (kainit). The variation in the quality of the hay is not shown in the tabulated results, but this point will be considered in dealing with the results on the different plots.

RESULTS ON THE LIMED PLOTS.

If plots 6 and 7 are compared on all three tables, it will be found that when lime has been applied there is a slight increase of crop for the first two years, but there is actually a smaller return in the third year. These results demonstrate that on land in poor condition lime has practically no effect. When farmyard manure and other manures, however, have been applied in conjunction with the lime—as in plots 7b and 7c—good results are got. On these plots, also, the quality of the herbage is improved, whereas lime itself has not brought about this improvement.

RESULTS WITH FARMYARD MANURE.

In 1891 the farmyard manure plots did not compare favourably with the other manures, but this result was partly due to the fact that this manure was not applied till the spring. The results on plots 6, 10, and 13, Table B., show a much better result for that manure the next season. Special attention is drawn to the results on plot 13, Table C. This plot had farmyard manure in 1891, and nitrate of soda and basic slag in 1892. In the former year this plot gave the best result, and it is evident that if these manures were applied alternately every two years to this land good crops of hay would be produced annually. In some districts where Timothy hay is grown extensively, this plan of manuring is practised, and gives excellent results.

RESULTS WITH NITRATE OF SODA.

Nitrate of soda has not been applied by itself, except to plot 15, Table C., but only in combination with other manures. Wherever it has been applied the grasses have been increased, and the clovers have been diminished; while the hay has reached maturity earlier in the season. A greater bulk of hay has been produced, as a result of the increased development of the stems of the grasses. This manure, however, has deteriorated the pasture for grazing purposes, as the bottom herbage is not so close nor of such fine quality. For this reason it is not advisable to apply nitrate of soda to grazing land, and when applied to a hay crop the quantity should not exceed 1 cwt. per acre.

RESULTS WITH PHOSPHATIC MANURES.

It will be observed from the results on Table A. that the superphosphate and the basic slag applied in 1890 do not give a material increase over the unmanured plots in the third season after their application

(1892); but that the plots to which bone meal and dissolved bones were applied at the same time, still continue to give increased returns. It is therefore concluded that dissolved bones, and especially bone meal, are more permanent in their action than superphosphate or basic slag. At the same time, however, the quality of the herbage is much better where the latter manures were applied than on the unmanured plots; the bottom herbage of the pasture is much thicker, and clover and allied plants are more abundant. Where superphosphate or basic slag has been applied for two years or for three years in succession the result is good, as is shown on Table B. and Table C. These manures applied by themselves have improved the field for purposes of pasturage more than for purposes of haymaking.

RESULTS WITH BASIC SLAG AS COMPARED WITH SUPERPHOSPHATE.

If the results on plots 1, 2, and 3, Tables A., B., and C., are compared, it is found that on the whole basic slag gives a better return than superphosphate, while the cost of the basic slag is much less. An equal amount of phosphoric acid is contained in the basic slag applied to plot 2, and in the superphosphate applied to plot 3. Apparently no advantage results from applying a mixture of basic slag and superphosphate as has been done on plot 1. This plot did best in 1890, but has not maintained its position in 1891 and 1892. Plots 9 and 11, Tables A., B., and C., on which these manures are applied by themselves, show results during 1890 and 1891 slightly in favour of superphosphate, but in 1892 all the results on these plots are in favour of basic slag. The latter manure only cost 6s., while the former cost 12s., per acre.

RESULTS WITH DISSOLVED BONES AND AN EQUIVALENT AMOUNT OF OTHER MANURES.

Plots 4 and 5, Tables A., B., and C., show the results from an application of dissolved bones, as compared with an application of superphosphate, basic slag, and nitrate of soda, containing the same amount of manurial ingredients as is contained in the dissolved bones. If the results on these plots over the three years are compared, it is found that the mixture is the most economical. The quality of the herbage, however, is best where the dissolved bones have been applied, and this manure is more permanent in its action.

RESULTS WITH A POTASH MANURE.

Plots 7 and 12, Tables B. and C., show how far kainit—a potash manure—is useful for this land. Clay soils are generally rich in potash, so that such good results would not be expected with this manure here, as on lighter land. In 1892, however, plots 7b and 7c gave much better results than plots 12b and 12c. The kainit has not only increased the bulk, but has also improved the quality of the herbage. The pasture on these plots had a darker green colour, and clover plants have been encouraged.

Plot 14, Tables B. and C., show the effect of a dressing of nitrate of soda and superphosphate. This plot has been added, as this manure is frequently applied to hay and pasture land in this district. The results show that it is a useful manure.

The nitrate of soda was applied to the plots about the middle of April. All the other manures were applied during February. The hay was mown on July 25th. Good weather continued from that date till the

29th, when the hay on each plot was weighed, and was afterwards carried to the stack. As the hay was in good condition when weighed, it will lose very little weight in the stack. The hay on the plots was weighed as follows :—A cart was partly loaded with hay from a portion of the field not under experiment. Across the top of this load a pole was laid, one end being tied down and the other projected over the side, from which a balance was suspended. Each heap of hay was placed in a large net and weighed on this balance, the cart being drawn from one plot to another until the hay on all the plots had been weighed.

SOME ECONOMICAL RESULTS OF THE EXPERIMENTS.

Table D. shows the net profit per acre over the three years accruing from the application of some of the manures. In calculating the results on this table, however, only the bulk of the hay produced has been taken into account, and no attempt has been made to deal with the variation in the quality of the hay. This table, therefore, indicates the economical results as to weight of herbage only. The extra hay produced is valued at 2*l.* per ton, which is approximately the consuming value of the hay produced on this farm. To make the table more intelligible, only a few of the results are contrasted, in order to show the economical effects from some of the different manures. It will be evident that the value of the unexhausted manures on plots 11*c*, 9*c*, and 2*c*, is much greater than on the other plots.

TABLE D.

No. of Plot.	Manure applied.	Cost of Manure over 3 Years.	Amount of Hay produced in 3 Years over the Average of the Un-manured Plots.	Value of increased Amount of Hay.	Net Profit per Acre over the 3 Years.
		£ s. d.	T. cwt. lbs.	£ s. d.	£ s. d.
11 <i>a</i> .	Basic slag (best)	0 8 9	0 14 71	1 9 6	1 3 6
9 <i>a</i> .	Superphosphate	0 11 11	0 15 9	1 10 3	0 18 3
4 <i>a</i> .	Dissolved Bones	1 7 6	1 1 71	2 3 6	0 16 0
5 <i>a</i> .	Equivalent to dissolved bones.	1 2 8	1 3 37	2 6 9	1 4 1
8 <i>a</i> .	Bone meal	1 8 0	0 17 83	1 15 3	0 7 3
6 <i>a</i> .	Lime	2 10 0	0 4 15	0 8 3	2 1 (loss)
2 <i>a</i> .	Basic slag, nitrate, and kainit.	0 18 3	1 5 67	2 11 0	1 12 9
11 <i>c</i> .	Basic slag (best)	0 18 0	1 5 47	2 10 10	1 12 10
9 <i>c</i> .	Superphosphate	1 15 8	1 5 9	2 19 2	0 14 6
2 <i>c</i> .	Basic slag, nitrate, and kainit.	2 16 0	2 6 99	4 13 9	1 17 0

QUALITY AND COST OF THE MANURES APPLIED IN 1892.

The nitrate of soda applied was of 95 per cent. purity, and therefore contained nitrogen equal to 19 per cent. of ammonia; 10*l.* 5*s.* was the price per ton for this manure, delivered at Welshpool. The basic slag contained phosphoric acid equal to 39 per cent. phosphate of lime, and the price per ton was 2*l.* 3*s.* The superphosphate contained soluble phosphoric acid equal to 28 per cent. phosphate of lime, and the price per ton was 3*l.* 2*s.* 6*d.* The dissolved bones contained soluble

phosphoric acid equal to $23\frac{1}{2}$ per cent. phosphate of lime, 18 per cent. of insoluble of lime, and nitrogen equal to 3 per cent. of ammonia; the price per ton was 5*l.* 16*s.* 6*d.* The kainit contained 12 per cent. of potash, the price per ton being 3*l.*

EFFECT OF THE MANURES ON THE QUALITY AND THE COMPOSITION OF THE HERBAGE.

The variation in the herbage of the different plots was still more marked during the past season than in previous seasons. The troublesome yellow rattle has been more abundant on many of the plots during the past season than previously. One of the objects in carrying out this experiment was to find whether this poor waedy pasture land could be practically freed from weeds by manuring only. It cannot, however, be said that this has been done. The weeds, however, have been considerably reduced on some of the plots, but even on the plots on which they are most reduced they are still a considerable source of trouble. Probably, however, the weeds would have been further reduced if the field had been grazed and not mown. It is certain, however, that under the present conditions of agriculture, to spend money on breaking up, cleaning, and re-sowing this field with grass and clover seeds would not be profitable. It is also a question whether the sowing of a renovating seeds-mixture on this land would be of much use, as when the plots have been manured judiciously an abundance of good pasture plants have appeared without the aid of such a seeds-mixture. The difficulty is that these better plants have not yet succeeded in evicting the troublesome weeds which are the tenants in possession.

MANURES FOR HAY AND PASTURE.

From the results of these and other experiments the following manures are suggested as being suitable for hay and pasture:—

For rye-grass and clover hay.—For land in good condition 1 cwt. per acre of nitrate of soda, or 1 cwt. sulphate of ammonia, is useful; the latter may be applied during March, and the former about the middle of April. If the land is in poor condition 2 cwt. superphosphate is a useful addition. This may be applied any time between December and March. Farmyard manure may be usefully applied to young grass and clover seeds in the autumn. On light soils this is an excellent practice.

For meadow land which is growing hay every year the following four course rotation of manuring would be suitable:—

1st year.—15 tons farmyard manure, applied in the autumn.

2nd year.—1 cwt. nitrate of soda.

3rd year.—4 cwt. basic slag, or 3 cwt. superphosphate, and 1 cwt. nitrate of soda.

4th year.—1 cwt. nitrate of soda.

For pasture land nitrate of soda should not be used, but otherwise the same course of manuring might be adopted until the pasture was in good condition, when a dressing of a few cwt. of basic slag or of superphosphate every four years would probably be sufficient.

After wet, marshy land has been drained, an application of lime generally gives excellent results. Lime is also useful for sour, stiff pasture land which is rich in plant food, as it stimulates the action of the plant food already present in the soil.

Every care has been taken in the sowing of the manures, and with the weighing and harvesting of the herbage from the different plots, in order to insure accurate results. The uniformity of the results over the three years is a testimony that this has been done.

GENERAL CONCLUSIONS.

The following conclusions may be drawn from the results of the experiments over three years on this land :—

Phosphatic manures, containing phosphoric acid in a condition easily assimilable, are the most valuable manures for improving such pasture land. These manures encourage a fine bottom growth of grass and clover herbage.

Superphosphate and basic slag are the most economical phosphatic manures for this land; and while both these manures give good results, on the whole the economic advantages are largely in favour of basic slag of the best quality. This, however, cannot be said of the basic slag of inferior quality. The results show that superphosphate and basic slag are practically exhausted in the third year after their application, but although the weight of the herbage is not increased after that time, the quality is very much improved, as well as the pasture for grazing purposes.

Bone meal and dissolved bones are more permanent in their effects than superphosphate or basic slag, but they act much more slowly, especially the bone meal. The herbage is now very much improved for grazing purposes where these manures have been applied.

Nitrate of soda largely increases the total bulk of hay produced, it encourages the strong growing grasses and brings the herbage earlier to maturity. The results show that this manure is valuable for producing heavy crops of hay, but that it is not suited for pasture land, as it destroys the fine bottom herbage by encouraging the coarse strong growing grasses, and by discouraging clovers and allied plants.

Kainit, as a potash manure, has given slightly increased results, but the value of the increased produce is less than the value of the kainit applied.

Lime applied to this exhausted land, even in the third season after application, has had almost no effect in improving the quality or bulk of the herbage.

In many cases the manures have encouraged the better hay and pasture plants, and have discouraged the weeds, but even on the plots that show most improvement, weeds are not exterminated, especially the yellow rattle, which has proved to be troublesome; probably, however, if the field had been kept under pasture instead of being mown, the weeds would have been further reduced.

(b.) SECOND REPORT ON EXPERIMENTS WITH PHOSPHATIC MANURES carried out in 1891 and 1892, at POOL QUAY, near WELSHPOOL.

(MR. CHARLES F. ARCHIBALD.)

The object of this experiment which was commenced in 1891 is to test the value of different phosphatic manures for grass land, the soil and sub-soil of the field selected for the purpose being composed of clay. The herbage at the commencement of the experiment in the spring of 1891 was exceedingly poor, consisting almost entirely of moss and worthless grasses with a large admixture of daisies, small thistles, and docks.

The plots were arranged in two groups, to one of which phosphates only were applied; the other was a duplicate of the first group, with the addition of nitrogen supplied by nitrate of soda, and potash supplied by kainit, to obviate any failure of the experiment from deficiency of those two essential plant foods. The dressings of $2\frac{1}{2}$ cwt. superphosphate, 4 cwt. slag, and the mixture of $1\frac{1}{2}$ cwt. superphosphate with $1\frac{1}{2}$ cwt. slag,

which are compared with each other, cost practically the same amount, whilst the bone flour was about three times as expensive as any of the other three. No additional manure was applied in 1892, the object of the experiment being to ascertain the action of the various dressings in the second season after their application, and to note their effect on the composition of the herbage.

The yield of grass in both the seasons over which the experiment has extended, together with the quantities and cost of the manures applied to each plot, are given in the tables annexed to this report. The grass was cut on July 20th and 21st in 1891, and on July 21st and 22nd in 1892, and the figures refer to the weight of the grass before being made into hay.

On examining the returns, the first noticeable point is that the crop in the second season was much lighter than that of 1891, the average produce on the unmanured plots decreasing from 4 tons 18 cwt. 34 lbs. to 3 tons 7 cwt. 6 lbs. This fact is due partly to the nature of the season and partly to the state of the grass when weighed, it having been in a much drier condition when cut in 1892 than in the previous year.

On considering the effect of the manures in the second season, it is evident that the plots which received phosphates only gave better results than those which received nitrate of soda and kainit in addition to the phosphates. This is no doubt due to the stimulating action of the nitrate, which encouraged a luxuriant growth in the first year, resulting in the appropriation by the crop of a larger amount of phosphoric acid than was the case on the plots which were not so stimulated. From this it follows that the land to which the nitrate was applied must have contained less phosphoric acid at the commencement of the second season than the other group of plots, hence the greater yield of plots 2, 3, 4, and 5 over the corresponding plots in 1892. In the group which received phosphates only the heaviest crop was obtained by the use of slag, while, in the group which received nitrate and kainit in addition, the mixture of slag and superphosphate gave the heaviest yield, the slag alone producing the second best result. Even in the second season, after application, it will be noticed that the bone flour, notwithstanding its far greater cost, compares very unfavourably with the other phosphatic manures. It is evident that the superphosphate used alone was by no means exhausted in the first year, but that on the contrary it produced 8 cwt. more grass per acre than the adjoining unmanured plot.

On comparing the total yield of the plots during both seasons, it will be noticed that the two groups approximate somewhat closely to each other, noticeably in the case of the superphosphate plots 2 and 7, and the slag plots 3 and 8, so that the application of nitrate of soda and kainit, though giving a much heavier crop in the first year, does not cause any considerable increase when the yield of the second season is taken into account. In both groups the best result was obtained from the use of slag, and the second best from the mixture of slag and superphosphate. The bone flour plot gave the smallest crop in each group.

No definite conclusions could be drawn as to the effect of the manures on the composition of the herbage. A careful inspection of the plots was made both in 1891 and 1892, and a comparison of the notes taken independently on each occasion shows that the herbage, both on the manured and unmanured land, has remained practically unaltered. The only point of importance which seems to be established by the records, is that the plots which received phosphates only presented a better appearance, and contained more white clover than the plots which received nitrate and kainit in addition to the phosphates.

The principal points to be noticed in this experiment are :—

- I. In the second season after the application of the manures the plots which were dressed with phosphates only yielded a better crop than the plots which received nitrate and kainit in addition.
- II. When the crops of both seasons are taken into consideration, the addition of nitrate and kainit gave no considerable increase in the yield, and there was, therefore, little or no return for their application.
- III. Slag gave much heavier crops than superphosphate for the same outlay.
- IV. Bone flour, even in the second season, compared very unfavourably with the other phosphatic dressings, notwithstanding its much greater cost.
- V. An application of 4 cwt. slag alone, at a cost of only about nine shillings, produced crops weighing 13 tons 6 cwt. 98 lbs. from land which when unmanured yielded about 8 tons 5 cwt. 40 lbs.
- VI. The herbage of the plots which received phosphates only looked better and contained more white clover than that of the plots which received nitrate and kainit in addition.

The aftermath is not taken into account, so the figures do not represent the full effect of the manures.

There are some interesting plots in the same field, initiated by the local schoolmaster, two of which illustrate the advantage of keeping farmyard manure under cover. The manure from under cover, though not well rotted and applied six weeks later than the manure from the open, nevertheless produced considerably the heavier crop of the two.

TABLE OF RESULTS.

No. of Plot.	Quantity of Manure per Acre.	Weight of Grass per Acre in 1891.	Weight of Grass per Acre in 1892.	Total Weight of Grass per Acre.	Increase over Average of unmanured Plots.	Approximate cost of Manure per Acre.
Phosphates only.	1 No manure - -	T. cwt. lb. 4 17 26	T. cwt. lb. 3 18 64	T. cwt. lb. 8 15 90	—	—
	2 2½ cwt. superphosphate.	7 7 66	4 6 58	11 14 12	3 8 84	0 8 0
	3 4 cwt. slag - -	8 9 2	4 17 96	13 6 98	5 1 58	0 9 0
	4 1½ cwt. superphosphate, 1½ cwt. slag.	7 19 62	4 3 104	12 3 54	3 18 14	0 8 6
	5 4 cwt. bone flour -	5 19 12	3 15 20	9 14 32	1 8 104	1 6 0
	6 No manure - -	4 4 92	3 2 106	7 7 86	—	—
Phosphates with 1 cwt. nitrate and 1 cwt. kainit.	7 2½ cwt. superphosphate.	8 10 100	3 5 50	11 16 38	3 10 110	1 0 6
	8 4 cwt. slag - -	9 18 84	3 11 78	13 10 50	5 5 10	1 1 0
	9 1½ cwt. superphosphate, 1½ cwt. slag.	8 19 92	3 15 110	12 15 90	4 10 60	1 0 6
	10 4 cwt. bone flour -	7 15 10	3 7 106	11 3 4	2 17 76	1 18 0
	11 No manure - -	5 12 96	2 19 62	8 12 46	—	—

(c.) REPORT OF EXPERIMENTS with GRASS and CLOVER SEEDS carried out at ABER.

(Mr. DOUGLAS A. GILCHRIST).

The object of these experiments, which are of interest on account of their being, it is believed, the first of the sort ever instituted in Wales, has been mainly to find out what hay and pasture plants are most suitable for the district.

The plots were each 8 ft. by 4ft., and the seeds were sown in September 1891.

The following are the common and botanical names of the various plants:—

Plot.	Popular Name.	Botanical Name.
1	KIDNEY VETCH - - - -	<i>Anthyllis Vulneraria.</i>
1a	WILD RED CLOVER (from Glansevern) -	<i>Trifolium pratense perenne.</i>
2	LUCERNE - - - -	<i>Medicago sativa.</i>
3	SAINFOIN - - - -	<i>Onobrychis sativa.</i>
4a	RIDGRASS OR PLANTAIN - - - -	<i>Plantago lanceolata.</i>
4b	YARROW OR MILFOIL - - - -	<i>Achillea Millefolium.</i>
5	SHEEP'S PARSLEY - - - -	<i>Petroselinum sativum.</i>
6	WOOD MEADOW GRASS - - - -	<i>Poa nemoralis.</i>
7	SMOOTH STALKED MEADOW GRASS -	<i>Poa pratensis</i>
8	COCKSFOOT - - - -	<i>Dactylis glomerata.</i>
9	PERENNIAL RYEGRASS (Aber seed from young plants).	<i>Lolium perenne.</i>
9a	PERENNIAL RYEGRASS (Aber seed from old plants).	<i>Ditto.</i>
10	PERENNIAL RYEGRASS (Hampshire seed) -	<i>Ditto.</i>
11	ditto (Devon Eaver variety)	<i>Ditto.</i>
12	ditto (Annual variety from Ayrshire)	<i>Ditto.</i>
13	ditto (from Ayrshire) - - - -	<i>Ditto.</i>
14	ITALIAN RYEGRASS (Home grown) -	<i>Lolium italicum.</i>
15	ditto (Imported) - - - -	<i>Ditto.</i>
16	TALL FESCUE - - - -	<i>Festuca elatior.</i>
17	TRUE FIORIN - - - -	<i>Agrostis alba, var. stolonifera.</i>
18	BIRDSFOOT TREFOIL - - - -	<i>Lotus corniculatus.</i>
18a	WOOD VETCHLING - - - -	<i>Lathyrus sylvestris.</i>
19	BROAD-LEAVED RED CLOVER - - - -	<i>Trifolium pratense.</i>
20	SINGLE-CUT COW GRASS CLOVER - - - -	<i>Trifolium pratense.</i>
21	ALSIKE CLOVER - - - -	<i>Trifolium hybridum.</i>
22a	WHITE OR DUTCH CLOVER - - - -	<i>Ditto repens.</i>
22b	ditto (wild) - - - -	<i>Ditto ditto.</i>
23a	YELLOW SUCKLING CLOVER - - - -	<i>Ditto minus.</i>
23b	TREFOIL OR YELLOW CLOVER - - - -	<i>Medicago lupulina.</i>
24	TRIFOLIUM OR SCARLET CLOVER - - - -	<i>Trifolium incarnatum.</i>
25	GOLDEN OAT GRASS - - - -	<i>Avena flavescens.</i>
26	TALL OAT GRASS - - - -	<i>Avena elatior or Arrhenatherum avenaceum.</i>
27	SWEET VERNAL - - - -	<i>Anthoxanthum odoratum.</i>
28	CRESTED DOGSTAIL - - - -	<i>Cynosurus cristatus.</i>
29	VARIOUS LEAVED FESCUE - - - -	<i>Festuca heterophylla.</i>
30a	HARD FESCUE - - - -	<i>Festuca duriuscula.</i>
30b	FINE-LEAVED SHEEP'S FESCUE - - - -	<i>Festuca ovina.</i>
31	MEADOW FESCUE - - - -	<i>Festuca pratensis.</i>
32	TIMOTHY OR CATTAIL - - - -	<i>Phleum pratense.</i>
33	ROUGH STALKED MEADOW GRASS - - - -	<i>Poa trivialis.</i>
34	MEADOW FOXTAIL - - - -	<i>Alopecurus pratensis.</i>

Nearly all the clover seeds had to be resown in the spring of 1892, as they failed to stand the winter, but very few of the grasses required to be resown. From this it is evident that, if young grass or clover seeds have been killed out during the summer by a heavy grain crop, or have failed in some other way, it is possible to sow grass seeds in the autumn, after the grain crop has been removed, if this is done before the middle of September, but clover seeds sown at the same time will probably not be successful.

It is generally considered that the following seven grasses are of most importance to the farmer:—Perennial ryegrass, Italian ryegrass, cocksfoot, timothy, meadow fescue, tall fescue, and meadow foxtail. Of these Italian ryegrass in the plots under experiment has produced the greatest amount of herbage during the first season. In this it has been closely followed by the annual variety of perennial ryegrass. Other varieties of perennial ryegrass all produced a large amount of herbage, while cocksfoot and timothy produced a fair amount of herbage that could have been mown. Meadow fescue and tall fescue produced a fair amount of herbage for grazing, but little which could have been mown. Meadow foxtail produced only a small amount of grazing herbage last season, and nothing which could have been mown. So far, meadow foxtail promises to be the best grazing plant among these seven grasses.

Among the grasses of secondary importance crested dogstail, sweet vernal, tall oat grass, and golden oat grass have matured seed in the first season after they were sown. Tall oat grass has been the most vigorous of these plants. None of the grasses outside of the seven important grasses above mentioned have so far shown any characteristics worthy of special notice.

Among the clovers, broad-leaved red clover produced the greatest amount of produce last season. Cow grass clover was not so vigorous. Although scarlet clover produced a fair crop last season, still the plant is probably too delicate for the district. Lucerne, kidney vetch, and hop trefoil all indicate, from the way in which they have grown, that they might be useful plants for the district.

A further experiment has been the sowing of 21 plots of various mixtures of grasses and clovers according to the plan given on the next page. The plots are $\frac{1}{4}$ of an acre, and the seeds were sown in the spring of 1892.

(d.) EXPERIMENTS ON PASTURE LAND at HAFODUNOS.

(MR. DOUGLAS A. GILCHRIST.)

These experiments have now been carried out for three years. In this district (North-west Denbighshire) considerable difficulty is experienced in keeping grass land in good condition. After it has been laid down for a few years, in many instances it becomes quite overrun with moss. A large amount of lime is applied to the pasture land of the district in order to prevent, if possible, this deterioration of the pasture. The object of the experiments has been primarily to test the effect of lime on such pasture land both by itself and in conjunction with other manures; but the effects of other manures without the addition of lime have also been tested. The land for the experiment had been under pasture for some years, and had deteriorated as above indicated. The field is rather high lying, but is in a fairly sheltered position. The soil is stiffish in quality and contains a considerable amount of vegetable matter. It is probably derived from the Wenlock-shale. The plots were carefully selected, so as to obtain similar conditions of soil on each of them. The experiments were initiated in March 1890, when the plots were marked off and the manures for the first season were applied. In seasons 1891 and 1892 all the manures were applied in the early spring, with the exception of nitrate of soda, which was not applied in each case till the middle of April. The tabulated results for the three years show the amount of manure per acre, applied each year on the different plots, as well as the cost. The results for 1890 are given as weight of hay produced per acre, while those for 1891 and 1892 give the calculated weight of hay per acre harvested from each plot. The herbage was weighed as grass and not as hay during seasons 1891 and 1892, and it is estimated that $4\frac{1}{2}$ tons of grass would be equivalent to 1 ton of hay. The hay was harvested in July of each year, the aftermath being afterwards grazed. No account of the aftermath is taken in the results given on the table. Four plots only were measured off in 1890, and these were sub-divided as shown on the table at the beginning of season 1891.

RESULTS WITH LIME ONLY.

If the results on plot 1 where lime is applied in 1890 are observed, practically no increase will be found over the unmanured plot in the first season. In the second season (1891), however, there is a substantial increase (plot 1a), and this is more than maintained in the third season (1892). The quality of the herbage, however, has not been so much improved on this plot as on some of the others.

On plot 2a, which has received no manure during the three years, the herbage was very poor, and was coarse and wiry; sedges and moss were abundant, while clover and allied plants were very little developed.

Plot 1a, to which lime only has been applied during the three years, shows little improvement in this respect over the unmanured plot except that moss has been distinctly diminished.

1890.				1891.				1892.			
Plot.	Manure per Acre.	Cost per Acre.	Weight of Hay per Acre.	Plot.	Manure per Acre.	Cost per Acre.	Weight of Hay per Acre.	Plot.	Manure per Acre.	Cost per Acre.	Weight of Hay per Acre.
1	4 tons lime.	3 0 0	0 17 96	1a	-	£ s. d. — — —	T. C. LB. 1 14 1	1a	-	£ s. d. — — —	T. C. LB. 1 15 4
				1b	4 cwt. basic slag; 1 cwt. nitrate of soda; 2 cwt. kainit.	1 2 6	2 5 33	1b	4 cwt. basic slag; 1 cwt. nitrate of soda; 2 cwt. kainit.	1 3 6	2 12 96
				1c	4 cwt. basic slag; 1 cwt. nitrate of soda.	0 17 6	2 4 0	1c	4 cwt. basic slag; 1 cwt. nitrate of soda.	0 17 6	1 19 49
2	No manure	—	0 16 4	1d	4 cwt. basic slag	0 8 6	1 5 62	1d	4 cwt. basic slag	0 8 6	1 14 49
				2a	-	—	1 4 0	2a	-	—	0 18 100
				2b	4 cwt. basic slag	0 8 6	1 5 9	2b	4 cwt. basic slag	0 8 6	1 17 51
3	4 cwt. basic slag	0 8 6	1 5 0	3a	-	—	1 17 25	3a	-	—	1 17 16
				3b	2 cwt. bone meal	0 12 0	1 17 25	3b	-	—	1 16 3
				4a	-	—	1 1 84	4a	-	—	0 17 70
4	3 cwt. superphosphate.	0 8 6	1 0 40	4b	3 cwt. superphosphate.	0 8 6	1 7 0	4b	-	—	1 1 3

RESULTS WITH LIME, BASIC SLAG, NITRATE OF SODA, AND KAINIT.

Plot 1b, in addition to receiving a dressing of lime in 1890, received a dressing of basic slag, nitrate of soda, and kainit, in the springs of 1891 and 1892. This results in a substantial increase in the amount of hay produced in both these seasons, the best result of all being given last year where the above were applied. The herbage here has been very much improved, and has resulted in the poor pasture being converted into an excellent meadow for mowing purposes. The hay produced was of excellent quality, in which sheep's fescue grass was abundant, along with a fair proportion of clover plants. Undoubtedly the effect of the addition of nitrate of soda has been to develop the strong growing grasses, and therefore to make this plot more suitable for mowing purposes, but at the same time not so valuable for grazing purposes.

RESULTS WITH LIME, BASIC SLAG, AND NITRATE.

Although kainit was not applied to plot 1c in 1891 it gave nearly as good a result as plot 1b, to which this had been applied, but in 1892 the addition of kainit has given an increase of 11 cwts. of hay per acre. It is just possible that part of this result may be due to the salt which is present in the kainit. The quality of the herbage was very much the same on plot 1c as on plot 1b, but clover was far more abundant on the latter plot. For grazing purposes the herbage on plots 1b and 1c has not been so much improved as on some of the other plots.

RESULTS WITH LIME AND BASIC SLAG.

On plot 1d lime was applied in the first season and basic slag in the two following seasons. Curiously a poorer result is got on this plot during seasons 1891 and 1892 than where lime only has been applied.

RESULTS WITH BASIC SLAG.

On plot 3a basic slag was applied in 1890, and on plot 3b bone meal was applied in 1891 in addition to slag in 1890. The results for the last two years show that while an excellent result is given by the slag alone, no improvement whatever has resulted from the application of the bone meal in addition to the slag. Last season, before the grass was removed, it was apparent that these plots had been much more improved for grazing purposes than any of the other plots, clover plants were developed very largely, and the fine bottom grasses were also well developed, the result being the growth of a fine crop of close sweet bottom herbage. It was evident, however, that the bulk of the herbage would be greater on plots 1b and 1c. On plot 2b basic slag was applied in 1891 and 1892. Very little increase was given during the first season, but last year an excellent result was obtained and the herbage was of excellent quality for grazing purposes.

If the results with lime and with basic slag are compared, it is found that the slag is much more efficacious in improving the quality of the herbage, and that it has produced a much greater bulk. The original cost of the slag was 8s. 6d. per acre, while the lime applied cost 3l. per acre.

RESULTS WITH SUPERPHOSPHATE.

Plot 4a had superphosphate applied in season 1890. A small result was given in the first season after its application, but during the last

two years this plot has not produced more than the unmanured plot, and the herbage has not improved in quality.

On plot 4b superphosphate was applied in seasons 1891 and 1892. A fair result with this manure was got in 1891, after it had been applied two years in succession, but in 1892 the result was little better than on the unmanured plot. The results on these plots show that superphosphate as a phosphatic manure is not at all suitable to this land, while basic slag, another phosphate manure, has proved more efficacious for improving this land for grazing purposes than any of the other manures used in the experiments.

QUALITY OF MANURES APPLIED.

The basic slag contained phosphoric acid equal to 40 per cent. phosphate of lime, and cost 2*l.* per ton. The superphosphate contained 27 per cent. of phosphate of lime made soluble, and cost about 2*l.* 15*s.* per ton. The kainit contained 12 per cent. of potash, and cost about 3*l.* per ton. The nitrate of soda contained nitrogen equal to 19 per cent. ammonia, and cost about 10*l.* per ton. The lime was estimated to cost 15*s.* per ton.

GENERAL CONCLUSIONS.

The soil on which this experiment was conducted contains 11·42 per cent. of organic or vegetable matter, and ·37 per cent. of lime. It is therefore poor in lime, but contains an excess of organic matter. The composition of the soil to a certain extent explains the results of the experiments.

Basic slag has given the best result, probably because it supplies lime to the land, and also because the kind of soil indicated is that on which the best results have been got by slag. It should be specially noted that where slag was used in conjunction with lime, the good results of slag were not nearly so apparent. This may be due to the fact that the lime had neutralised the organic acids which otherwise would have acted on the slag. Basic slag has been more effectual in improving this land for grazing purposes than any of the other manures applied. The results show that 4 cwt. of basic slag applied per acre in 1890, at a cost of 8*s.* 6*d.*, have during the three years given an increase of over 2 tons of hay, and that increase was greater in the third year after its application than in the first or second. It is evident, therefore, that at the end of three years this manure has not been exhausted on this land.

Superphosphate, another phosphatic manure, has given very poor results. This indicates that an acid manure like superphosphate is not suitable for pasture land which is poor in lime, and which, because of excess of organic matter, is probably in an acid condition.

Lime has given a much better result in this experiment than in other similar experiments conducted in North Wales. This is explained by the fact that there is an excess of organic matter in this soil for the lime to act on, and further, that because of the deficiency of lime in this soil, a supply of lime is wanted to act directly as a plant food. Apparently, however, the small amount of lime added in a dressing of 4 cwt. of slag to the acre, has supplied a sufficient amount of lime for purposes of plant food. The results indicate that basic slag will improve this land much more effectually than lime, and at a less cost.

The results with bone meal indicate that this manure acts very slowly in improving this land.

Nitrate of soda has greatly increased the total bulk of hay produced, but where this manure has been applied the land is not so much improved for grazing purposes.

Kainit, a potash manure, has on plot 1b, season 1892, given an excellent result.

(e.) FIRST REPORT ON EXPERIMENTS WITH MANURES applied over a ROTATION OF CROPS, at BETTWS, near NEWTOWN.

(MR. CHARLES F. ARCHIBALD.)

The object of the experiments commenced in 1892 at the Glynn, Bettws, near Newtown, is to ascertain the effect and comparative economy of various dressings of manures applied over a rotation of crops consisting of roots, barley, clover, wheat. It was thought that an experiment of this nature might be of considerable value, by throwing light on several points which occur in ordinary farm practice. The land chosen for the plots was clean, uniform in character, and exceedingly poor in condition, as is evident from the yield of the unmanured plot, from which a plot equal to only 2 tons of swedes per acre was obtained. The land was therefore in a condition to respond readily to the application of fertilisers, and it moreover represents an average soil of the district, for though thoroughly exhausted, it is a good medium soil when properly treated. The following table shows the scheme of manuring which it is intended to follow during the rotation.

The object of plots 2, 3, and 4 is to ascertain whether it is most economical to apply the farmyard manure to the root crop, or to the seeds, or half to the root crop and half to the seeds. These three plots receive the same total amount of manures during the rotation, but applied in a different manner.

Plot 5 is to test the effect of a good dressing of farmyard manure throughout the rotation, without the aid of artificials.

Plots 6, 7, and 8 give a comparison between vitriolised or partly dissolved raw bones and cheaper dressings of phosphates. Plots 7 and 8 also illustrate the effect of a double dressing of phosphates, and the three plots show how far artificial manures alone are able to supply the place of farmyard manure.

Plots 9 and 10 were added at the request of the local committee to test the effect of superphosphate alone and of slag alone. Plots 2, 3, 4, and 5 receive farmyard manure during the rotation, the other plots are manured with artificials only. The experiments will not be completed till the end of the rotation, but several points of interest have been brought out by the results of the first season.

Each plot is $\frac{1}{10}$ th acre in size, and is separated from the neighbouring plots by a pathway about 2 feet wide, the object of which is to prevent any overlapping of the manures.

The manures, except the nitrate of soda, were applied on May 26th and 27th, and the swede seed was sown on the latter date. The nitrate was added on July 14th, when the young plants were ready to make use of it immediately. The swedes came up well at first, but suffered much from "the fly" and from the late frosts, so much so that it was feared that it would be necessary to drill turnips in their place. They, however, subsequently recovered, and early in July there was a regular growth on all the manured plots. It is interesting to note that on July 6th all the plots were described as looking well and healthy, except 1 and 5. These two plots were the only ones which did not receive a

TABLE.

Crop.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1892. SWEDES.	No manure.	20 tons farmyard manure. 4 cwt. super- phosphate.	$\frac{3}{4}$ cwt. nitrate. 4 cwt. super- phosphate.	10 tons farmyard manure. $\frac{1}{2}$ cwt. nitrate. 4 cwt. super- phosphate.	20 tons farmyard manure.	6 cwt. dissolved bones. 1 cwt. nitrate.	3 cwt. slag. 8 cwt. super- phosphate. 1 cwt. nitrate.	6 cwt. slag. 6 cwt. super- phosphate. 1 cwt. nitrate.	8 cwt. slag.	5 cwt. super- phosphate.
1893. BARLEY (with seeds).	:		1 cwt. nitrate.	$\frac{1}{2}$ cwt. nitrate.		1 cwt. nitrate.	1 cwt. nitrate.	1 cwt. nitrate.		
1894. CLOVER and RYEGRASS.		$\frac{3}{4}$ cwt. nitrate.	20 tons farmyard manure.	10 tons farmyard manure.		4 cwt. dissolved bones. 2 cwt. kanit.	4 cwt. slag. 2 cwt. kanit.	8 cwt. slag. 2 cwt. kanit.	4 cwt. slag.	2 $\frac{1}{2}$ cwt. super- phosphate.
1895. WHEAT.		1 cwt. nitrate.		$\frac{1}{2}$ cwt. nitrate.		1 cwt. nitrate.	1 cwt. nitrate.	1 cwt. nitrate.		

II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE. 73

dressing of phosphates, and illustrate the fact that phosphates in some readily available form are most valuable in giving the swedes a good start, thus helping the crop to combat the attack of the turnip-flea, beetle, or "fly," and that it is desirable to apply such a manure even when a liberal quantity of farmyard manure is used.

The following is the analysis and cost of the artificial manures used.

Manure.	Analysis.	Cost per Ton, including Carriage.
Superphosphate - -	{ Soluble phosphate 26 per cent. Insoluble phosphate $7\frac{1}{2}$ per cent. }	£ s. d. 3 1 0
Basic slag - - -	{ Phosphoric acid=tribasic phosphate of lime $40\frac{1}{2}$ per cent. }	2 5 0
Vitriolised raw bones -	{ Soluble phosphate $4\frac{1}{2}$ per cent. Insoluble phosphate $34\frac{1}{2}$ per cent. Nitrogen=ammonia $3\frac{1}{2}$ per cent. }	6 16 0
Nitrate of soda - -	Less than 5 per cent. of impurities.	9 15 6

The following table shows the quantity of manures applied, and the crop of swedes obtained from each plot, all the calculations being made per acre. The swedes were weighed on November 24th, and the figures give the weight of clean swedes free from tops and roots. They are valued at ten shillings per ton in accordance with the figure put upon them by the local committee. The farmyard manure is valued at five shillings per ton.

No. of Plot.	Quantity of Manure per Acre.	Quantity of Swedes per Acre.	Value of Produce per Acre.	Cost of Manure per Acre.	Excess of Value of Produce over Cost of Manure.	Order according to Profit.
1	No manure - - - -	T. cwt. lbs. 2 0 0	£ s. d. 1 0 0	£ s. d. —	£ s. d. 1 0 0	10
2	20 tons farmyard manure - } 4 cwt. superphosphate - }	25 0 110	12 10 0	5 12 0	6 18 0	9
3	4 cwt. superphosphate - } ½ cwt. nitrate - }	16 14 12	8 7 0	0 16 10	7 10 2	4
4	10 tons farmyard manure - } 4 cwt. superphosphate - }	23 4 64	11 12 3	3 6 10	8 5 5	1
5	20 tons farmyard manure -	24 15 50	12 8 7	5 0 0	7 8 7	6
6	6 cwt. vitriolised bones - } 1 cwt. nitrate - }	19 2 16	9 11 0	2 10 3	7 0 9	8
7	3 cwt. slag - - - } 3 cwt. superphosphate - }	18 9 22	9 5 0	1 5 6	7 19 6	2
8	6 cwt. slag - - - } 6 cwt. superphosphate - }	20 0 110	10 0 6	2 1 3	7 19 3	3
9	8 cwt. slag - - -	16 15 36	8 7 6	0 18 0	7 9 6	5
10	5 cwt. superphosphate -	16 1 8	8 0 6	0 15 0	7 5 6	7

On examining the returns the first point to notice is the value of farmyard manure for the root crop, the three plots which received it,

namely, 2, 4, and 5, giving the three heaviest crops. The advantage of adding phosphates, however, in giving the swedes a good start, has already been alluded to.

Phosphates alone are not sufficient to produce a full crop, as is evident from the returns of plots 9 and 10. These plots also show that basic slag compares favourably with superphosphate as a manure for swedes, even under the disadvantage of being applied so late in the season as the last week of May. The value of nitrogen in the form of nitrate of soda is strikingly shown on comparing the yield of plots 9 and 10 with that of plot 7.

It is very important to ascertain the most economical quantity of manure to apply, and some light is thrown on this point by plots 7 and 8. Plot 7 received 3 cwt. superphosphate, 3 cwt. slag, and 1 cwt. nitrate, and produced 18 tons 9 cwt. 92 lbs. of swedes, whilst plot 8, which received double the amount of phosphates, and the same amount of nitrate, produced 20 tons 0 cwt. 110 lbs., or an increase of 1 ton 11 cwt. only, which was barely sufficient to compensate for the extra outlay. This clearly shows that the crop can only make full use of a certain quantity of manure, and that it is therefore extravagant to apply more than a reasonable dressing, though the amount which can be profitably employed will, of course, vary with the circumstances. In this connection it is worth noticing that the comparatively small amount of manure applied to plot 3, namely, 4 cwt. superphosphate and $\frac{1}{2}$ cwt. nitrate, was sufficient to produce a crop weighing 16 tons 14 cwt. from land which was practically exhausted, and only capable of producing 2 tons when unmanured.

It is difficult to estimate the value of the farmyard manure, as it is made on the farm, whereas the artificial manures have to be bought, and it is therefore impossible to make an exact economic comparison. But on the assumption that 5s. per ton has to be paid for it, it is evident, when the swede crop alone is considered, that it does not compare favourably with some of the dressings of artificial manures. It may, however, be safely stated that a moderate dressing of farmyard manure, supplemented by phosphates and nitrate of soda, is the most generally desirable method of manuring the swede crop, but that a mixture of phosphates and nitrate is capable of producing a good crop without the aid of any farmyard manure.

(4.) THE DURHAM COLLEGE OF SCIENCE on behalf of the
NORTHUMBERLAND COUNTY COUNCIL.

(DR. WM. SOMERVILLE.)

 (a.) EXPERIMENTS on the MANURING of TURNIPS at 4 different
STATIONS.

This experiment was arranged principally to test the relative values of the chief varieties of phosphatic manures. To this object plots 2, 3, 4, 5, 6, 9, and 10, with their duplicates, were devoted. Five cwt. of bone meal were taken as the basis of the calculations, and the same weight of phosphoric acid (or its computed equivalent of phosphate of lime) was applied in the case of the other manures, except where a manure contained soluble phosphate, and then 2 lbs. of such phosphate were considered equivalent to 3 lbs. of insoluble phosphate. When a phosphatic manure contained either no nitrogen, or less than the bone meal, the necessary quantity was added in the form of blood meal, a substance which contains nitrogen in much the same form as bones.

TABLE I.

Plots.	Manure per Acre.	Cost per Acre.
		s. d.
1 and 1A	Nothing.	—
2 „ 2A	5 cwt. bone meal, $\frac{1}{2}$ cwt. nitrate of soda, and 2 cwt. kainit.	38 0
3 „ 3A	361 lbs. steamed bone flour, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 180 lbs. blood meal.	39 6
4 „ 4A	332 lbs. Australian guano, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 211 lbs. blood meal.	38 6
5 „ 5A	539 lbs. superphosphate, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 225 lbs. blood meal.	40 6
6 „ 6A	564 lbs. dissolved bones, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 58 lbs. blood meal.	44 0
7 „ 7A	300 lbs. dissolved bones, and 2 cwt. kainit	20 6
8 „ 8A	352 lbs. superphosphate, 2 cwt. kainit, and 88 lbs. blood meal.	20 6
9 „ 9A	575 lbs. vitriolised bones, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 44 lbs. blood meal.	44 0
10 „ 10A	590 lbs. Thomas' phosphate, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 225 lbs. blood meal.	36 0
11 „ 11A	393 lbs. Thomas' phosphate, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 225 lbs. blood meal.	32 0
12 „ 12A	786 lbs. Thomas' phosphate, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 225 lbs. blood meal.	40 0
13 „ 13A	269 $\frac{1}{2}$ lbs. superphosphate, 295 lbs. Thomas' phosphate, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 225 lbs. blood meal.	38 0
14 „ 14A	1 cwt. bone meal, 72 lbs. steamed bone flour, 108 lbs. superphosphate, 113 lbs. dissolved bones, 118 lbs. Thomas' phosphate, $\frac{1}{2}$ cwt. nitrate of soda, 2 cwt. kainit, and 138 lbs. blood meal.	39 6
15 „ 15A	539 lbs. superphosphate, $\frac{1}{2}$ cwt. nitrate of soda, and 225 lbs. blood meal.	36 6
16 „ 16A	539 lbs. superphosphate, $\frac{1}{2}$ cwt. nitrate of soda, 225 lbs. blood meal, and 4 cwt. kainit.	44 6
17 „ 17A	539 lbs. superphosphate, $\frac{1}{2}$ cwt. nitrate of soda, 225 lbs. blood meal, and 16 loads farmyard manure.	16 6
18 „ 18A	16 loads farmyard manure	80 0
19 „ 19A	539 lbs. superphosphate and 16 loads farmyard manure	96 6
20 „ 20A	539 lbs. superphosphate	16 6

 Size of plots $\frac{1}{16}$ of an acre.

One-half cwt. of nitrate of soda and 2 cwt. of kainit were applied to all the plots where the phosphates were being generally compared, so that the action of the phosphate might not be restricted by the crop suffering from the want of nitrogen or potash, as it is necessary in testing the value of an essential constituent of plant food, like phosphates, to make sure that the crop has access to all the other substances that it requires, otherwise the material whose efficacy it is desired to ascertain cannot possibly exert its full effects.

This experiment was also designed to furnish practical information on several other important points, but at present it may be well to give attention only to the question: Which is the best phosphatic manure?

Since every plot concerned in throwing light on this question received exactly the same weight of nitrogen and potash, and an *equivalent* weight of phosphate of lime (calculated as explained below), it will, probably, be sufficient if, in making comparisons, reference is simply made to the phosphatic manure, without mentioning nitrate of soda, blood meal, or kainit. Every detail, however, as regards the dressings, will be found in Table I.

5 cwt. bone meal contained 107·52 lbs. phosphoric acid (=234·72 lbs. phosphate of lime) and 23·52 lbs. nitrogen (=28·55 lbs. ammonia), and equivalent quantities of these substances were contained in 361 lbs. steamed bone flour, and 180 lbs. of blood meal; in 332 lbs. Australian guano and 211 lbs. blood meal; in 539 lbs. superphosphate and 225 lbs. blood meal; in 564 lbs. dissolved bones and 58 lbs. blood meal; in 575 lbs. vitriolised bones and 44 lbs. blood meal; and in 590 lbs. Thomas' phosphate, and 225 lbs. blood meal.

TABLE II.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
1 and 1A	Nothing - - -	18	19	—	—	s. d.
2 „ 2A	Bone meal - - -	22	6½	3	7½	11 3
3 „ 3A	Steamed bone flour -	23	11	4	12	8 7
4 „ 4A	Australian guano -	22	2¾	3	3¾	12 1
5 „ 5A	Superphosphate -	24	13	5	14	7 1
6 „ 6A	Dissolved bones -	24	9½	5	10½	8 0
9 „ 9A	Vitriolised bones -	24	16	5	17	7 6
10 „ 10A	Thomas' slag -	24	14	5	15	6 3

The phosphatic manure that has, on the whole, done best is vitriolised bones, this having given the largest yield five times out of eight. At one station this manure heads the list on both sets of plots, while at 3 others it occupies or shares the first place once in each case. Over the 8 plots on the 4 stations it has produced on an average 24 tons 16 cwt. of turnips, which is 2 cwt. more than the crop furnished by the slag. Although the slag has not grown the biggest crop in any case it

has produced the second largest on 3 occasions, and as the dose employed cost 8s. per acre less than in the case of the vitriolised bones, the slag is the cheapest manure, as is seen from the last column of Table II. The crop grown by the superphosphate approximates very closely to that got by the slag, there being on an average a difference of but a cwt. between them, but the superphosphate being somewhat more expensive, the economic difference is rather greater than that indicated by the yield. Dissolved bones occupy the fourth place (Table II.), having produced 24 tons 9½ cwt. on an average over all the plots. The steamed bone flour has produced, roughly speaking, about a ton less than the manures already noticed, and about a ton more than the bone meal.

Australian guano has come out decidedly the worst of all, it being absolutely the worst 3 times out of 8, and sharing the same position with bone meal on other two occasions. It is rather remarkable that 7 times out of 8 one or other of these two manures was at the bottom of the list.

These results must, of course, be accepted in a liberal spirit. That manures which contain soluble phosphate should act well on the crop to which they are immediately applied is no more than would have been expected. The soluble plant-food is immediately available and stimulates growth directly after being applied, but just on account of its solubility there will be less of it left in the ground for succeeding crops. It would, for this reason, be expected that succeeding crops would receive more benefit from vitriolised bones applied to turnips than from dissolved bones, and more from the latter manure than from the superphosphate. And the same arguments may be applied where minuteness of sub-division is taken into account. Steamed bone flour, for instance, acts better than bone meal, largely because it is finer ground. The low position of the Australian guano may to some extent be due to its comparative coarseness, and it is now a universally recognised fact that much of the value of slag is due to its fineness. In connection with this experiment, however, reference can only be made to the results of the manuring of the turnip crop, the effect of the manures on the succeeding cereals and grass must be left to a subsequent occasion. It is quite evident, however, that unless a considerable return is to be got during succeeding years, very few of the manures have proved directly profitable, and it is possible that some of the manures that have not produced the cheapest crop of turnips may, in the end, prove to be the best.

Another part of the inquiry concerns itself with ascertaining whether a mixture of superphosphate and blood meal is as profitable a turnip manure as dissolved bones. This question has been dealt with in the preceding table to some extent, but opinions differ so much regarding the relative values of soluble phosphates when derived from bone, or from purely mineral sources, that it was thought desirable to investigate the matter somewhat more fully.

It has already been seen that the difference between plots 5 and 6 is, on the whole, very slight, but such as it is, it is in favour of superphosphate. If reference be now made to plots 7 and 8 with the duplicates (Table III.), it will be seen that the same weight of kainit is applied in both cases, and also the same weight of nitrogen, for 88 lbs. of blood meal contain exactly the same amount of nitrogen as 300 lbs. of dissolved bones. The price in both cases, too, will be found to be the same, namely, 20s. 6d. per acre.

TABLE III.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
7 and 7A	{ 300 lbs. dissolved bones 2 cwt. kainit - -	22	14	8	15	s. d. 5 6
8 „ 8A	{ 352 lbs. superphosphate 88 lbs. blood meal - 2 cwt. kainit - -	23	3	4	4	4 11

It was not to be expected that much difference in the yields would be got by using equal cash-values of dissolved bones and of a mixture of superphosphate and a nitrogenous substance (in this case blood meal), and this has actually proved to be the case. In fact, the results got at the various stations show that the premier position is equally divided between these two manurial dressings, the dissolved bones being first 4 times, and the superphosphate and blood meal on a similar number of occasions. On the average the superphosphate and blood have produced 9 cwt. more than the dissolved bones, the cost per ton of increase being in the former case 4s. 11d. and the latter 5s. 6d. So far as the turnip crop is concerned it would thus appear that, on the whole, the dissolved bones is the less profitable dressing; whether the succeeding crops will be better in the one case than the other or not, cannot at present be said.

If a comparison is made between Tables III. and II. it is seen that the smaller doses of superphosphates, &c., and of dissolved bones, &c., produce the cheaper turnips, and in nearly all the experiments it is found that small dressings show the greatest *direct* profit.

The next comparison is as to the results got on plots 5, 11, and 12 (and their duplicates). These plots have been manured with the special object of ascertaining whether, weight for weight, phosphoric acid is as effective in slag as in superphosphate, or whether it takes 2 lbs. of insoluble phosphoric acid in slag to produce as good results as 1 lb. of soluble phosphoric acid in superphosphate. 539 lbs. of superphosphate and 393 lbs. of Thomas' slag hold equal quantities of phosphoric acid, and, of course, 780 lbs. of slag hold twice as much. The details of the dressings of the plots referred to will be found on Table I., and it will be seen that the nitrogen and potash are the same in all cases, the only difference being in the phosphoric acid, which varies as explained above. It will be noted that at the usual market prices 2 lbs. of phosphoric acid in basic slag can be purchased for about the price that will have to be paid for 1 lb. in superphosphate.

TABLE IV.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
5 and 5A	539 lbs. superphosphate -	24	13	5	14	s. d. 7 1
11 „ 11A	393 lbs. Thomas' slag -	24	7½	5	8½	5 11
12 „ 12A	786 lbs. Thomas' slag -	25	10	6	11	6 1

The results show that although on the average the superphosphate produces a larger yield than the same quantity of phosphoric acid in slag (plot 11), still the difference, being only $5\frac{1}{4}$ cwt., is hardly sufficiently great to justify it being said that the phosphoric acid in slag is not as effective, weight for weight, as the same substance in superphosphate. When price is taken into consideration, however, the results are very considerably in favour of the slag. Table IV. shows that each ton of increase in the case of the superphosphate cost 7s. 1d., whereas in the case of the smaller dose of slag it only cost 5s. 11d.

By comparing plots 12 and 5, it will be seen that a double dose of phosphoric acid in slag is much more effective on the whole than a single dose in the form of superphosphate, the difference in the yield being 17 cwt., and the price of the manure being, in both cases, practically the same.

Plots 11 receiving 393 lbs. of slag, and 10 receiving 590 lbs., and 12 receiving 786 lbs., &c., may be compared together, when it will be found that the average yields are 24 tons $7\frac{1}{4}$ cwt., 24 tons 14 cwt., and 25 tons 10 cwt. respectively, showing that, on the whole, the crop has responded to the application of increasing quantities of this manure.

In the next place, inquiry may be made as to whether anything is to be gained by mixing two or more phosphatic manures together as compared with using them separately. Theoretically it would appear to be a good plan to apply both a soluble and an insoluble substance to the land, the soluble being immediately available as plant food, and the insoluble serving to nourish the crop after the other has been used up. It is probably to this cause that the good effects of vitriolised bones are to be ascribed, a substance which contains both soluble and insoluble phosphate.

In the set of experiments under discussion, two plots, with duplicates, were manured with a mixture of phosphates, plots 13 and 13A receiving one-half of the superphosphate that plots 5 and 5A received, and one-half of the slag that was applied to plots 10 and 10A. Plots 14 and 14A received a much more complex mixture, no less than 5 phosphatic manures being represented in its composition. These were bone meal, steamed bone flour, superphosphate, dissolved bones, and Thomas' phosphate, the amount of each being one-fifth of the quantity applied in the case of plots 2, 3, 5, 6, and 10 respectively, with their duplicates. In the case of plots 13, 14, 13A, and 14A the amount of nitrogen and potash supplied is exactly the same as in the case of all the other plots so far considered, the actual details of the dressings being stated in Table I.

TABLE V.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure:	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
13 and 13A	As above	25	$11\frac{3}{4}$	5	$12\frac{3}{4}$	s. d. 5 9
14 " 14A	As above	24	$19\frac{1}{4}$	6	$0\frac{1}{4}$	6 7
	Average of 5 and 10	24	$13\frac{1}{4}$	5	$14\frac{1}{4}$	6 8
	" 2, 3, 5, 6, 10	23	$18\frac{3}{4}$	4	$19\frac{3}{4}$	7 11

Looking first of all at the yields obtained from plots 13 and 13A, where a mixture of superphosphate and slag is applied, and comparing the results with those got on plots 5 and 10, with duplicates, where the same substances were used separately, it is found that a very considerable saving has been effected by mixing the manures. The average gain over all the plots, as shown by Table V., is $18\frac{1}{4}$ cwt. or, in money value, $11d.$ per ton of turnips. As the average increase over all the stations is 6 tons $12\frac{3}{4}$ cwt. by using the mixture, as compared with the unmanured plots, the gain per acre amounts to the no inconsiderable sum of $6s. 1d.$

In the case of the more complex mixture the gain is even greater, for it will be seen that whereas an expenditure of $7s. 11d.$ has been necessary, on the average, to produce a ton of turnips when bone meal, steamed bone flour, superphosphate, dissolved bones, and Thomas' phosphate were used separately, a ton is produced for $6s. 7d.$ when they are used in conjunction. On a crop where the increase is about 6 tons, as compared with the yield without using any manure, this represents a gain of $8s.$ per acre.

Three plots in duplicate on each station were arranged so as to show whether the use of kainit is profitable in a turnip manure, and, if so, whether 2 cwt. or 4 cwt. may be most economically applied per acre. The plots that throw light on this question are 15, which receives no kainit; 5, which receives 2 cwt. per acre; and 16, which receives 4 cwt. per acre besides superphosphate, &c.

TABLE VI.—AVERAGE OVER ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
15 and 15A	No kainit - - -	23	$4\frac{1}{2}$	4	$5\frac{1}{2}$	s. d. 8 7
5 " 5A	2 cwt. kainit - - -	24	13	5	14	7 1
16 " 16A	4 cwt. kainit - - -	24	12	5	13	7 11

An inspection of this table shows that the kainit has paid well on the whole, and notably where the smaller quantity was used. This is a result not altogether unexpected, because kainit contains other things besides potash, chiefly common salt and chloride of magnesium, and when the latter substance is applied in large quantities direct to a growing crop or to turnip-drills, it is apt to do harm rather than good. As a matter of fact, kainit should be applied to land in autumn, so that the winter's rains may have the opportunity of removing the deleterious chlorides beyond the reach of the plants. The valuable potash, however, is not removed to any appreciable extent, for the soil has a great affinity for this substance, and retains it energetically till the plants are in a position to make use of it. The manures in these experiments were all applied immediately before sowing the turnip seed, as it was impossible to do otherwise, for the season was far advanced before the experiments could be taken in hand. But the trials show that 2 cwt. of kainit may be very profitably employed even so late as the end of May.

the average increase of crop when that quantity was used (plot 5), as compared with the cost where no kainit was employed (plot 15), being 1 ton 8½ cwt. As the kainit only cost 4s. it means that 2s. 9d. worth of kainit produced on an average 1 ton of turnips.

Another, and a very important, matter which these trials were designed to elucidate, is the use of nitrogen in a turnip manure. It is by no means unusual to find farmers applying 5 or 6 cwt. of Superphosphate alone to their turnips, without the addition of any nitrogenous manure whatsoever. A practice so common deserved some attention, and plots 15 and 20, with their duplicates, were designed to show whether phosphates alone are sufficient to grow a crop of turnips. Plots 15 and 15A received nitrogen in the form of nitrate of soda and blood meal, while plots 20 and 20A received no nitrogen at all.

TABLE VII.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
1	Nothing - -	18	19	—	—	s. d.
20	Superphosphate, no nitrogen	19	12½	—	13½	24 5
15	Superphosphate and nitrogen	23	4½	4	5½	8 7

Comparing plots 20 and 15, it will be noted that the addition of nitrogen has produced a large increase in the yield. This increase was got by the application of 20s. worth of manure (the difference in the cost of the manuring of plots 15 and 20), so that each ton of increase was got at an outlay of about 5s. There is thus no doubt that it pays to supplement a non-nitrogenous phosphatic manure with some nitrogenous substance, although it is probable that 20s. expended on nitrogen is more than is required. This experiment was not designed to show what is the most economical quantity of nitrogen to apply, and, for the reason stated in an earlier part of this report, it was intended that the nitrogen should be present beyond the needs of the crop. It shows very conclusively, however, that nitrogen is wanted, but what the dressing should be may form the subject of a future demonstration.

In Table VII. the weight of the crop got without any manure is included, in order that it may be contrasted with that which was produced under the influence of 539 lbs. of superphosphate. It must here be pointed out that the returns from the several stations show that five times out of eight a dressing of nearly 5 cwt. of superphosphate has not only failed to give any increase, but has positively caused a falling off in the crop. Over all the stations it has, however, produced an increase of 13½ cwt., but this has been got at the highly unremunerative rate of 24s. 5d. per ton of turnips. Scarcely anything is more emphasised in these trials than the fact that it is highly unprofitable to use a purely phosphatic manure alone for the growth of turnips.

Finally, so far as these local turnip experiments are concerned, the effect of using farmyard manure alone and in combination with artificials must be looked at, the artificials containing in one case nitrogen and in the other case none.

TABLE VIII.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase compared with no Manure.		Cost per Ton of Increase.
		Tons.	Cwt.	Tons.	Cwt.	
18	16 Loads dung - -	23	6½	4	7½	s. d. 18 3
19	16 Loads dung and 539 lbs. superphosphate - -	24	15½	5	16½	16 6
17	16 loads dung, 539 lbs. superphosphate and nitrogen - -	25	14½	6	15½	17 2

Table VIII. shows that on the average the addition of 539 lbs. of superphosphate to 16 loads of dung has resulted in an increase of 1 ton 9½ cwt. of turnips, but as this increase has been got at an expenditure of 16s. 6d. on superphosphate, it means that each ton of turnips has cost 11s. 3d., which is probably more than most farmers would care to pay for them.

Coming next to the question of whether nitrogenous artificial manure should be applied with phosphates to farmyard manure, the table shows that the addition of the nitrogen has increased the crop by 19 cwt., but as this nitrogen cost 20s., it means that the increase of turnips was got at an outlay of fully 20s. per ton.

One feature of the above results that comes out very strikingly is that if the dung is valued at 5s. per load,—and this seems a moderate price to include cartage and spreading—it is a very expensive material with which to grow turnips. Certainly the effects are not exhausted in the first year, but neither, as a matter of fact, are the effects of most of the artificial manures, but still most of the return is expected in the turnip crop. The dung is made on the farm and must be used, but it is somewhat doubtful if it would pay anyone to buy it at that price. Probably it gives a better return when used in smaller quantities than 16 loads an acre, and although no artificial manure will keep the land in as good heart as dung, still it is not unlikely that the fertility is procured at too high a figure. On the average plot 17, with farmyard manure and artificials, gave the largest yield of turnips, with 25 tons. 14½ cwt., while plot 13, with a mixture of superphosphate and slag, is only 3 cwt. behind, and plot 12, with slag, has produced over all 25½ tons of turnips.

The results obtained (1) with 539 lbs of superphosphate alone, (2) with the same amount of superphosphate and 16 loads of dung, and (3) with the same amount of superphosphate along with ½ cwt. of nitrate of soda, 2 cwt. kainit, and 225 lbs. of blood meal, are rather curious. The following table shows the average results over the four stations:—

TABLE IX.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure. (See Table I.)	Yield.		Increase over 539 lbs. of Superphosphate.	
		Tons.	Cwt.	Tons.	Cwt.
20	539 lbs. of superphosphate -	19	12½	—	—
5	539 lbs. of superphosphate, with nitrogen and potash -	24	13	5	0½
9	539 lbs. of superphosphate, with 16 loads dung -	24	15½	5	3½

It will be noticed that the nitrate of soda, kainit, and blood meal, costing 24s., have produced an increase of crop amounting to 5 tons $\frac{1}{2}$ cwt., while the 16 loads of dung, valued at 4l., have produced practically the same increase, the difference being less than 3 cwt. In the former case the increase was procured at about the rate of 5s. per ton, while in the latter each ton of turnips was costing nearly 16s.

Or the case may be looked at in another way. Plot 15 received superphosphate, nitrate of soda, and blood meal; plot 17 received the same substances, and 16 loads of dung in addition; while plot 5 received 2 cwt. of kainit instead of the dung. The average results over all the stations are shown in the following table:—

TABLE X.—AVERAGE OF ALL THE STATIONS.

Plots.	Manure.	Yield.		Increase over Plot 15.	
		Tons.	Cwt.	Tons.	Cwt.
15	Superphosphate and nitrogen -	23	4 $\frac{1}{2}$	—	—
17	Superphosphate, nitrogen, and dung - - - - -	25	14 $\frac{3}{4}$	2	10 $\frac{1}{2}$
5	Superphosphate, nitrogen, and potash - - - - -	24	13	1	8 $\frac{3}{4}$

From this it will be seen that 16 loads of dung have produced an increase of 2 tons 10 $\frac{1}{2}$ cwt., and this, at 5s. per load of dung, means that the turnips are costing over 31s. per ton. The 2 cwt. of kainit, costing 4s., have increased the crop by 1 ton 8 $\frac{3}{4}$ cwt., equal to a cost per ton of 2s. 2d.

The question of the relative values of dung and artificial manures throughout a series of years is one of very great importance to farmers, and is a subject that should be taken vigorously in hand as soon as possible. An opportunity has now been granted of carrying through some rotation experiments with a view to finding out how dung may be best applied in a rotation, and in three years time some valuable information should be forthcoming.

The general conclusions that may be drawn from these experiments may be summarised as follows:—

1. Thomas' basic slag is the cheapest pure phosphatic manure.
2. A mixture of slag and superphosphate is a more efficacious dressing than either of these substances used separately.
3. Part of a turnip manure should consist of soluble phosphate.
4. Kainit as a rule may be profitably added at the rate of 2 cwt. per acre to a turnip manure.
5. A purely phosphatic manure is quite unable to grow a full crop of turnips, a certain amount of nitrogen being absolutely necessary.
6. Superphosphate alone added to dung is not directly profitable when used in large doses.
7. Nitrogen used in the quantities of the experiment is not a profitable addition to 16 loads of farmyard manure.

84 II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE.

8. So far as the turnip crop is concerned, artificial manures are more profitable than dung.
9. Small doses of artificial manures are always more directly profitable than large doses.

(b.) EXPERIMENT ON the MANURING OF POTATOES at Hawkhill, Alnwick.

A few trials were here made upon the effects of various manures on the potato crop. Table I. shows the quantities and kinds of manures employed, with the total cost of the dressings per acre. As before, farmyard manure is valued at 5s. per load.

TABLE I.

Plots.	Manure per Acre.	Cost per Acre.
		<i>s. d.</i>
1 and 1A	Nothing.	
2 " 2A	$\frac{1}{2}$ cwt. nitrate of soda and $\frac{1}{2}$ cwt. sulphate of ammonia -	10 6
3 " 3A	3 cwt. superphosphate of lime - - - - -	10 4
4 " 4A	5 cwt. kainit - - - - -	10 5
5 " 5A	$\frac{1}{2}$ cwt. nitrate of soda, $\frac{1}{2}$ cwt. sulphate of ammonia, and 3 cwt. superphosphate.	20 10
6 " 6A	$\frac{1}{2}$ cwt. nitrate of soda, $\frac{1}{2}$ cwt. sulphate of ammonia, and 5 cwt. kainit.	20 11
7 " 7A	3 cwt. superphosphate and 5 cwt. kainit - - - - -	20 9
8 " 8A	$\frac{1}{2}$ cwt. nitrate of soda, $\frac{1}{2}$ cwt. sulphate of ammonia, 3 cwt. superphosphate, and 5 cwt. kainit.	31 3
9 " 9A	16 loads farmyard manure - - - - -	80 0
10 " 10A	16 loads farmyard manure, $\frac{1}{2}$ cwt. nitrate of soda, $\frac{1}{2}$ cwt. sulphate of ammonia, 3 cwt. superphosphate, and 5 cwt. kainit.	111 3

Each plot extended to $\frac{1}{16}$ of an acre, and the trials were conducted in duplicate.

The experiments were arranged to show the economic result of various dressings, and the effect on the growth of potatoes of:—

1. Nitrogenous manure alone (plots 2 and 2A).
2. Phosphatic manure alone (plots 3 and 3A).
3. Potassic manure alone (plots 4 and 4A).
4. Nitrogenous and phosphatic manures (plots 5 and 5A).
5. Nitrogenous and potassic manures (plots 6 and 6A).
6. Phosphatic and potassic manures (plots 7 and 7A).
7. Nitrogenous, phosphatic, and potassic manures (plots 8 and 8A).
8. Farmyard manure alone (plots 9 and 9A).
9. Farmyard manure along with a general artificial dressing (plots 10 and 10A).

From the first this experiment promised to be one of much interest. At a very early stage in the progress of the trial one could not fail to be struck with the marked effect the manures had on the colour and vigour of the leaves and haulms. Indeed, anyone not knowing that an

experiment was in progress would have thought that the land was stocked in narrow stripes with 8 or 10 different varieties of potatoes.

The following table gives the yield of good marketable and small potatoes:—

TABLE II.

Plots.	Manure. (See Table I.)	Produce.				Plots.	Produce.			
		Good.		Small.			Good.		Small.	
		Tons. 2	Cwt. 14	Tons. 1	Cwt. 7½	1A	Tons. 4	Cwt. 0½	Tons. 0	Cwt. 18
1	Nothing - -									
2	Nitrogen - -	3	6	1	0	2A	4	18	1	0
3	Superphosphate -	4	12	1	4½	3A	5	0	0	10
4	Kainit - - -	6	2½	0	16	4A	6	0	0	12
5	Nitrogen and superphosphate.	4	15½	1	2½	5A	3	12	0	16
6	Nitrogen and kainit.	6	11½	0	10	6A	3	13½	0	10
7	Superphosphate and kainit.	5	17½	0	17½	7A	6	6	0	9
8	Nitrogen, super- phosphate, and kainit.	6	6½	0	16	8A	5	16	0	9
9	Dung - - -	6	14½	1	4½	9A	8	16	0	12
10	Dung and Arti- ficials.	7	16½	0	16	10A	8	6½	0	14½

This experiment would have been a very satisfactory one but for the crop grown on plots 5A and 6A. It was at once evident, when the weights were sent in, that the part of the field occupied by these plots must have been subjected to some special manurial or other treatment in past years, to account for the peculiar position occupied by the yield of these plots, and this opinion has been borne out by subsequent information.

There is, therefore, justification in making comparisons as regards plots 1 to 10, but not as regards plots 1A to 10A. In the following remarks, then, the "A" plots will be neglected.

Looking at plot 1 the large proportion of small potatoes is very striking. Out of a total crop of 4 tons 1¼ cwt., no less than 1 ton 7¼ cwt. are below marketable size, equal to over 33 per cent. The plants had evidently been unable to obtain nourishment enough to bring about normal growth of the tubers. Plot 2 shows that nitrogenous manure alone produced but a small increase in the crop; in the aggregate, only of 4½ cwt., but in good potatoes alone of 12 cwt. The per-centage of small in the case of this plot is about 23. The superphosphate alone did considerably better than the nitrogen alone, as is seen by comparing plots 2 and 3. The proportion of small is very much the same, being about 21 per cent. on plot 3. The kainit that was applied to plot 4 has done much better than either the nitrogen on plot 2 or the phosphate on plot 3. Not only is the gross yield very large on plot 4, but the proportion of small potatoes is very much less, amounting only to about 11 per cent. Plot 5 shows that the nitrogen and phosphate combined have produced more than either the one or the other used separately. It is seen also from plot 6 that the mixture of nitrogen and kainit has

produced an increased yield as compared with the cases where these substances were used alone. If a comparison is made of plot 6 with plot 2 it is found that the increase of good potatoes amounts to 3 tons 5½ cwt., which may be placed to the credit of the kainit, and by comparing plot 6 with plot 4 it is seen that only 8¾ cwt. of good potatoes can be ascribed to the influence of the nitrogen. The proportion of small potatoes under the influence of the mixed nitrogenous-potassic manure is very little more than 7 per cent. The yield got on plot 7, which was dressed with both kainit and superphosphate, is scarcely so good as on plot 4 without the superphosphate, which means that the superphosphate has been unable to add anything to the yield produced by kainit alone. The produce of plot 7 is, however, 1¼ tons better than that of plot 3 which got superphosphate alone, and again it is seen how the kainit has reduced the per-centage of small potatoes. As was to be expected plot 8, receiving nitrogen, superphosphate, and kainit, yielded a heavy crop. It will be seen that the small and large tubers together amount to exactly 1 cwt. more than those got from plot 6, which received no superphosphate, while the proportion of small to large is decidedly more favourable in the case of plot 6. This is the second time that no material increase is found to result from the addition of superphosphate to a manurial dressing which contained kainit. The farmyard manure alone (plot 9) has produced a larger yield than any of the artificial dressings, though the per-centage of small tubers is higher than in some of the other cases. It will be seen, on referring to plot 10, that although a mixed artificial dressing added to farmyard manure has only been instrumental in increasing the *gross* yield by 13½ cwt., as compared with farmyard manure alone, it has been able to increase the good potatoes by nearly 22 cwt. It will thus be found, with potatoes selling at a fair price, to have been a profitable addition to the dung.

(5.) ESSEX AGRICULTURAL SOCIETY.

(DR. BERNARD DYER AND MR. ROSLING.)

Oats after Cabbages.—In order to see how far the heavy manuring adopted for some of the cabbage plots in 1891 affected the subsequent fertility of the soil, this crop was followed by oats. It was intended to treat the oats with no manure at all, but, by an oversight, the plots were once dressed with the rest of the field with a top-dressing of nitrate of soda, which, however, only amounted to half a cwt. per acre.

The following table recapitulates the cabbage results of 1891, and shows the yield of oats and straw obtained in 1892 without further treatment than the $\frac{1}{2}$ cwt. nitrate of soda already mentioned.

MANURIAL TREATMENT.

	1891.		1892.	
	Cabbages per Acre.		Oats.	Straw.
	T.	c.	Bushels.	T. c. q.
A *14 tons dung, 2 cwt. nitrate of soda -	20	10 $\frac{1}{2}$	49·24	1 11 1
B 14 tons dung, 4 cwt. nitrate of soda -	24	7 $\frac{3}{4}$	59·56	1 14 0
C 14 tons dung, 2 cwt. nitrate of soda, 4 cwt. superphosphate.	26	1	63·04	1 15 2
D 14 tons dung, 4 cwt. nitrate of soda, 4 cwt. superphosphate.	28	14 $\frac{1}{2}$	63·24	2 5 1
E 14 tons dung, 4 cwt. nitrate of soda, 3 cwt. salt, 4 cwt. superphosphate.	28	18 $\frac{1}{2}$	72·52	1 18 1
F 14 tons dung - - - -	22	14 $\frac{1}{2}$	72·08	1 14 1
G 14 tons dung, 4 $\frac{3}{4}$ cwt. saltpetre, 4 cwt. superphosphate.	26	16 $\frac{1}{2}$	71·56	1 17 1
H 14 tons dung, 2 cwt. nitrate of soda, 3 cwt. guano.	26	5 $\frac{3}{4}$	72·00	1 15 2
I 14 tons dung, 4 cwt. nitrate of soda, 3 cwt. guano.	27	6	68·60	1 14 2
J 14 tons dung, 4 cwt. nitrate of soda, 3 cwt. salt, 3 cwt. guano.	29	9	71·68	2 3 0
K Nothing - - - -	17	1 $\frac{1}{2}$	61·44	1 13 2
L 14 tons dung, 4 $\frac{3}{4}$ cwt. saltpetre, 3 cwt. guano.	29	14 $\frac{1}{2}$	69·88	1 19 1
M 14 tons dung, 3 cwt. guano - -	24	16 $\frac{1}{2}$	71·44	1 18 2
N 14 tons dung, 4 cwt. superphosphate -	21	2 $\frac{1}{2}$	50·92	1 11 1

* This plot was influenced by the shelter of trees, and, therefore, cannot be fairly taken into comparison with the others.

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The following table shows the increase of cabbages and increase or decrease of oats yielded by the plots artificially manured as well as dunged, compared with those yielded by dung alone.

Artificial applied to Cabbages in 1891.	1891.		1892.			
	Increase of Cabbages per Acre as compared with Dung alone.		Increase in		Decrease in	
			Oats.	Straw.	Oats.	Straw.
	T.	c.	Bus.	c. q.	Bus.	c. q.
B 4 cwt. nitrate of soda	1	13½	—	—	12.52	0 1
C 2 cwt. nitrate of soda, 4 cwt. superphosphate.	3	6½	0	1 1	9.04	0 0
D 4 cwt. nitrate of soda, 4 cwt. superphosphate.	6	0½	0	11 0	8.84	0 0
E 4 cwt. nitrate of soda, 4 cwt. superphosphate, 3 cwt. salt.	6	4½	0.44	4 0	—	—
G 4½ cwt. nitrate of potash, 4 cwt. superphosphate.	4	2½	0	3 0	.52	0 0
H 2 cwt. nitrate of soda, 3 cwt. guano	3	11½	0	1 8	.03	0 0
I 4 cwt. nitrate of soda, 3 cwt. guano	4	11½	0	0 1	3.48	0 0
J 4 cwt. nitrate of soda, 3 cwt. guano, 3 cwt. salt.	6	14½	0	8 3	.40	0 0
L 4½ cwt. nitrate of potash, 3 cwt. guano.	7	0½	0	5 0	2.20	0 0
M 3 cwt. guano	2	2½	0	4 1	.54	0 0
N 4 cwt. superphosphate	a decrease	—	—	—	21.16	3 0

An examination of these results shows that in a number of cases the yield of grain was neither decreased nor diminished to any practical extent. In the cases in which it does appear to have been materially affected, a decrease is found of over 12 bushels on plot B, manured with only nitrate in addition to dung, and it is to be noted that this plot had given the smallest increase in cabbages. On plot C, manured with a small dressing of nitrate and with superphosphate, there is a decrease of 9 bushels of oats, following an increase of over 3½ tons cabbages. On plot D, dressed with a large dressing of nitrate and with superphosphate, there is also a decrease of nearly 9 bushels of oats, though this is nearly made up by an increase of 11 cwt. in the straw; but here it must be remembered that the increase in cabbages was 6 tons per acre. On plot E, where salt was used in addition to the same high dressing of nitrate and superphosphate, and where the *gain* of cabbages had been 6½ tons per acre, the oat crop more than maintained its level with dung alone, producing nearly ½ bushel more grain and 4 cwt. more straw per acre. Excluding plots M and N, which were not manured with nitrate and scarcely bear on this part of the question, it is found that the average increase of cabbages was 4½ tons per acre, and that this was followed by an average decrease of 4 bushels of oats and an increase of 3½ cwt. straw. But if only the plots whose manurial treatment for cabbage resulted satisfactorily, *i.e.*, plots D, E, G, I, J, and L are taken, it is found that an average increase of 5½ tons of cabbages per acre was followed by a decrease of only 2½ bushels of oats and an increase of 5 cwt. of straw.

The increase of straw more than balances in value the decrease of grain, and the average increase of 5½ tons of cabbages on these six highly manured plots was produced at an average outlay of rather less than 13s. a ton.

II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE. 91

Manure.	Increase of Cabbages over unma- nured Land.	Cost of Manures.	Value of Increase in Cabbages at 10s. per Ton
DUNGED PLOTS.			
	T. c.	£ s. d.	£ s. d.
Dung 14 tons only (mean) - - -	6 13	3 10 0	3 6 6
Dung 14 tons, super 4 cwt. - - -	9 4	4 2 0	4 12 0
Dung 14 tons, super 4 cwt., nitrate 4 cwt. -	14 9	6 0 0	7 4 6
Dung 14 tons, guano 3 cwt. - - -	11 14	4 12 6	5 17 0
Dung 14 tons, guano 3 cwt., nitrate 4 cwt. -	14 5	6 10 6	7 2 6
UNDUNGED PLOTS.			
Super 4 cwt., nitrate 4 cwt., salt 3 cwt. -	11 10	2 14 6	5 15 0
Guano 3 cwt., nitrate 4 cwt., salt 3 cwt. -	9 11	3 5 0	4 15 6

As accords with previous experience in mangold growing, artificials alone give more remunerative results than dung, if the dung be wholly charged to this one crop. The following table shows for the dunged plots, the work done by the artificials, in addition to that done by the dung only, and the cost at which it was effected:—

Manure, in addition to 14 Tons Dung.	Increase of Cabbages due to Artificials over and above Dung.	Cost of Artificials.	Value of Increase in Cabbages
	T. c.	£ s. d.	£ s. d.
Super 4 cwt. - - - - -	2 11	0 12 0	1 4 6
Super 4 cwt., nitrate 4 cwt. - - - - -	7 16	2 10 0	3 18 0
Guano 3 cwt. - - - - -	5 1	1 2 6	2 10 6
Guano 3 cwt., nitrate 4 cwt. - - - - -	7 12	3 0 6	3 16 0

On the whole, the results are similar to those of 1891, except that the failure of the first sowing threw the whole crop back, so that while the yield of the best plots in 1891 approached 30 tons of cabbages per acre, in 1892 it did not get much beyond 23 tons.

So far the experiments appear to indicate that a very large increase in cabbages is obtainable by the use of artificials, either with or without dung, at a very reasonable cost. Salt, which elsewhere has given remarkably good results with cabbages, does no good to this crop on this land, nor does potash. A dressing of 4 cwt. superphosphate and 4 cwt. of nitrate of soda, the latter being applied in several successive doses, raised, when used without dung, the produce by $11\frac{1}{2}$ tons of cabbages per acre, at a cost of only 4s. 9d. per ton of cabbages. Used with dung it raised the produce by $7\frac{3}{4}$ tons beyond the yield of the dung only, at a cost of 6s. 5d. per ton.

It is proposed to grow oats on the cabbage plots of 1892 without additional manure, and to make a still further series of cabbage experiments.

Potatoes.—The variety grown was Magnum bonum. The phosphatic and ammoniacal manures, salt, muriate of potash, and sulphate of ammonia, were sown on May 2nd. On the plots receiving 4 cwt. of nitrate of soda per acre, 1 cwt. was sown with the other manures.

The potatoes were planted between May 3rd and May 5th.

The nitrate was (except for the 1 cwt. already mentioned) applied in top dressings at the rate of 1 cwt. nitrate per acre each time on June 21, July 2, and August 8.

The guano used contained 39·69 per cent. of phosphate and nitrogen equal to 8·01 per cent. of ammonia; the superphosphate contained 26·98 per cent. of soluble phosphate and 7 per cent. of insoluble phosphate. The muriate of potash contained 85·92 per cent. of pure muriate of potash, the nitrate of soda 96·74 per cent. of pure nitrate, and the sulphate of ammonia 25·01 per cent. of ammonia.

The plots were $\frac{1}{8}$ acre each in area. The results were as follows:—

Manure per Acre.	Potatoes.
No manure - - - - -	T. c. q.
Ditto - - - - -	7 5 2
Mean of these plots - - - - -	7 3 0
Dung 7 tons - - - - -	7 4 1
Dung 7 tons, super 4 cwt., nitrate of soda 2 cwt. - - - - -	10 9 2
Dung 7 tons, super 4 cwt., nitrate of soda 4 cwt. - - - - -	11 13 0
Dung 7 tons, super 4 cwt., nitrate 2 cwt., muriate of potash 2 cwt. - - - - -	11 4 0
Dung 7 tons, guano 3 cwt., nitrate 2 cwt. - - - - -	10 10 0
Dung 7 tons, guano 3 cwt., nitrate 4 cwt. - - - - -	10 9 0
Dung 7 tons, guano 3 cwt., nitrate 2 cwt., muriate of potash 2 cwt. - - - - -	10 19 2
Dung 7 tons, super 4 cwt., sulphate of ammonia $1\frac{1}{2}$ cwt. - - - - -	11 3 0
Dung 7 tons, super 4 cwt., sulphate of ammonia 3 cwt. - - - - -	10 13 3
Dung 7 tons, super 4 cwt., sulphate of ammonia $1\frac{1}{2}$ cwt., muriate of potash 2 cwt. - - - - -	10 8 1
Dung 14 tons - - - - -	13 8 2
Dung 14 tons, super 4 cwt., nitrate 2 cwt. - - - - -	12 0 0
Dung 14 tons, super 4 cwt., nitrate 4 cwt. - - - - -	11 14 2
Dung 14 tons, super 4 cwt., nitrate 2 cwt., muriate of potash 2 cwt. - - - - -	11 4 2
Dung 14 tons, guano 3 cwt., nitrate 2 cwt. - - - - -	11 14 2
Dung 14 tons, guano 3 cwt., nitrate 4 cwt. - - - - -	11 14 0
Dung 14 tons, guano 3 cwt., nitrate 2 cwt., muriate of potash 2 cwt. - - - - -	12 4 2
Dung 14 tons, super 4 cwt., sulphate of ammonia $1\frac{1}{2}$ cwt. - - - - -	12 2 3
Dung 14 tons, super 4 cwt., sulphate of ammonia 3 cwt. - - - - -	11 6 2
Dung 14 tons, super 4 cwt., sulphate of ammonia $1\frac{1}{2}$ cwt., muriate of potash 2 cwt. - - - - -	12 11 3
	11 15 1

A perusal of the results shows that while 7 tons of dung raised the unaided produce of the soil by $3\frac{1}{2}$ tons per acre, the doubling of this dressing to 14 tons of dung only produced $1\frac{1}{2}$ tons more, and that the addition of artificials, when the larger quantity of dung was used, did not further remuneratively increase the crop—unless apparently in the case of the last plot on the list, the result of which will be again referred to. On the lightly dunged plots the best results were obtained—with one exception—by the use of 4 cwt. of superphosphate and 2 cwt. of nitrate, which gave 1 ton $3\frac{1}{2}$ cwt. more than dung alone. On the lightly dunged plots the application of potash, where added to superphosphate or nitrate, appeared to have a negative value. Added to guano and nitrate, it appeared to result in a gain of 14 cwt.; while added to superphosphate and sulphate of ammonia it seemed to give an increase of $2\frac{3}{4}$ tons.

On the heavily dunged plots potash produced no increase with superphosphate and nitrate, but again gave a small gain (8 cwt.) with guano and nitrate, and a large gain, nearly $2\frac{1}{2}$ tons, with superphosphate and

sulphate of ammonia. It is to be noted that the Peruvian guano used in these potato experiments was rich in ammonia salts, so that it is found that the use of muriate of potash was in every case followed by an increase in crop where ammonia salts were used, though not where they were absent. This leads to the question whether in any way the potash may have contributed to the assistance of nitrification of the ammonia salts? The advantage shown, however, was small, and may have been due to mere accident, except in the case of the heaviest plot of each series; and here it must be pointed out that these two potash plots on which such considerable increase is shown are in line, and form one boundary of the block of experimental plots. Possibly this strip of land is more naturally fertile than that occupied by the remaining plots, and the better crop may be due to this, and not to the potash. It seems to be a fact that parallel to and not far from these plots there formerly ran a ditch, which was filled in, and the proximity of which site may still produce some direct or indirect effect on the fertility of the soil.

Below is given the increase of crop over the unmanured land and the cost of manuring, taking the dung at 5s. per ton, superphosphate at 3l., guano at 10l., nitrate at 9l. 10s., sulphate of ammonia at 10l. 15s., and muriate of potash at 8l. 15s. In valuing the increase, potatoes are taken as being worth 50s. per ton:—

Manure per Acre.	Excess of Crop over unmanured Soil.	Cost of Manure.	Approximate Value of Increase in Potatoes at 50s. per Ton.
	T. c.	£ s. d.	£ s. d.
Dung 7 tons - - - - -	3 5 $\frac{1}{2}$	1 15 0	8 3 0
Dung 7 tons, super 4 cwt., nitrate 2 cwt. -	4 8 $\frac{3}{4}$	3 6 0	11 2 0
Dung 7 tons, super 4 cwt., nitrate 4 cwt. -	3 19 $\frac{3}{4}$	4 5 0	9 19 6
Dung 7 tons, super 4 cwt., nitrate 2 cwt., muriate of potash 2 cwt.	3 5 $\frac{3}{4}$	4 3 6	8 4 6
Dung 7 tons, guano 3 cwt., nitrate 2 cwt. -	3 4 $\frac{3}{4}$	4 4 0	8 2 0
Dung 7 tons, guano 3 cwt., nitrate 4 cwt. -	3 15 $\frac{1}{2}$	5 13 0	9 8 0
Dung 7 tons, guano 3 cwt., nitrate 2 cwt., muriate of potash 2 cwt.	3 18 $\frac{3}{4}$	5 1 6	9 17 0
Dung 7 tons, super 4 cwt., sulphate of ammonia 1 $\frac{1}{2}$ cwt.	3 9 $\frac{1}{2}$	3 3 2	8 13 9
Dung 7 tons, super 4 cwt., sulphate of ammonia 3 cwt.	3 4	3 19 3	8 0 0
Dung 7 tons, super 4 cwt., sulphate of ammonia 1 $\frac{1}{2}$ cwt., muriate of potash 2 cwt.	6 4 $\frac{1}{4}$	4 0 8	15 10 6
Dung 14 tons - - - - -	4 15 $\frac{3}{4}$	3 10 0	11 19 6
Dung 14 tons, super 4 cwt., nitrate 2 cwt. -	4 10 $\frac{1}{2}$	5 1 0	11 5 6
Dung 14 tons, super 4 cwt., nitrate 4 cwt. -	4 0 $\frac{1}{2}$	6 0 0	10 0 6
Dung 14 tons, super 4 cwt., nitrate 2 cwt., muriate of potash 2 cwt.	4 10 $\frac{1}{4}$	5 18 6	11 5 6
Dung 14 tons, guano 3 cwt., nitrate 2 cwt. -	4 9 $\frac{3}{4}$	5 19 0	11 7 0
Dung 14 tons, guano 3 cwt., nitrate 4 cwt. -	5 0 $\frac{1}{2}$	6 18 0	12 10 6
Dung 14 tons, guano 3 cwt., nitrate 2 cwt., muriate of potash 2 cwt.	4 18 $\frac{1}{2}$	6 16 6	12 6 3
Dung 14 tons, super 4 cwt., sulphate of ammonia 1 $\frac{1}{2}$ cwt.	4 2 $\frac{1}{4}$	4 18 2	10 5 6
Dung 14 tons, super 4 cwt., sulphate of ammonia 3 cwt.	5 7 $\frac{1}{2}$	5 14 3	13 8 9
Dung 14 tons, super 4 cwt., sulphate of ammonia 1 $\frac{1}{2}$ cwt., muriate of potash 2 cwt.	6 11	5 15 6	16 7 6

Wheat.—The following are the results of trials of various varieties of wheat. The field was one in which oats had previously been grown.

The seed was drilled in the fourth week in November 1891, at the rate of $2\frac{1}{4}$ bushels per acre, 2 cwt. of phosphatic Peruvian guano being applied before drilling. The crop was top-dressed twice with half cwt. nitrate of soda during the spring.

Each variety had given to it a plot of three-fifths of an acre, and all plots were treated precisely alike.

The following table shows the time at which each plot flowered and the yield per acre, the varieties being divided into red and white, and placed in such class according to their yield per acre:—

Variety of Seed.	Date of flowering.	Yield, Bush. per Acre. (63 lbs. to the Bushel.)	Remarks.
Red.			
Browick - - -	July 1	44·15	Stood best.
Square Head's Master - -	July 1	43·12	Stood fairly well.
Scholey's Square Head -	June 28	43·07	Stood second best.
Sharpe's Standard Red -	June 30	42·95	Stood third best.
Hallett's Pedigree Golden Drop	June 28	40·87	Stood fairly well.
Nursery - - -	June 28	35·50	Stood fairly well.
Rivetts - - -	July 2	37·41	Stood fairly well.
White.			
Rough Chaff - - -	June 27	39·12	Went down on June 29, but recovered next day.
Carter's Pearl - - -	June 27	37·98	Stood fairly well.
Hardcastle - - -	June 28	32·90	Stood fairly well.
Sharpe's Standard White -	June 28	31·11	Went down worst but one.
Carter's Queen - - -	June 30	31·09	Went down worst.
Mixture of various varieties red and white	—	37·26	Stood fairly well.

The red varieties averaged 41·61 bushels.

The white varieties averaged 34·91 bushels.

The Rivett wheat yielded unusually small berries, and seems to have been generally an unsuccessful crop last year.

The results obtained by these experiments, showing an average advantage of nearly 7 bushels per acre in the yield of red as compared with that of white wheats, point to the advisability of sowing red instead of white varieties, while the difference in price between the two sorts (only 1s. to 3s. per qr.) continues so small.

The wheats which "stood best" as a rule yielded best.

Barley.—A series of experiments in barley was carried out (for the first time) in 1892 by Mr. Reginald Christy, of Boyton Hall, Roxwell.

The field chosen had been twice cropped with corn, viz., wheat in 1890 and barley in 1891. The field was ploughed in winter and drag-harrowed on April 4th, when the seed was sown, together with all artificials except nitrate, which was top-dressed in two doses, viz., on May 13th and on June 3rd. On May 25th, between the two dressings of nitrate, there was a heavy thunderstorm, with nearly 1 inch of rainfall.

The soil was much more calcareous than the Melbourne soils, and at the same time more clayey.

The superphosphate used contained 24·46 per cent. of soluble and 5·88 per cent. of insoluble phosphates; the guano contained 54·56 per cent. of phosphates and nitrogen equal to 3·22 per cent. of ammonia;

II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE. 95

the sulphate of ammonia contained 25·04 per cent. of ammonia; the muriate of potash, 81·75 per cent. of pure muriate; and the nitrate of soda, 97·81 per cent. of pure nitrate.

The dressings and the yield of grain were as follows :—

Manure per Acre.	Barley per Acre.
	Bushels.
No manure - - - - -	39·50
No manure - - - - -	40·00
Superphosphate 3 cwt. - - - - -	35·74
Guano 2 cwt. - - - - -	40·00
Superphosphate 3 cwt., nitrate of soda 1 cwt. - - - - -	45·74
Guano 2 cwt., nitrate 1 cwt. - - - - -	47·50
Superphosphate 3 cwt., sulphate of ammonia 1 cwt. - - - - -	42·50
Guano 2 cwt., sulphate of ammonia 1 cwt. - - - - -	49·00
Nitrate 1 cwt. - - - - -	52·00
Sulphate 1 cwt. - - - - -	44·24
Nitrate 1 cwt., muriate of potash 1 cwt. - - - - -	47·50
Super 3 cwt., nitrate 1 cwt., muriate of potash 1 cwt. - - - - -	50·00
Guano 2 cwt., nitrate 1 cwt., muriate of potash 1 cwt. - - - - -	47·74

Manures.	Increase of Crop over unmanured Land.	Cost of Manure.	Value of Increase at 27s. per Qr.
	Bushels.	£ s. d.	£ s. d.
Superphosphate only - - - - -	—	0 9 0	—
Guano only - - - - -	—	0 15 0	—
Super and nitrate - - - - -	5·74	0 18 6	0 19 4
Guano and nitrate - - - - -	7·50	1 4 6	1 5 4
Super and sulphate of ammonia - - - - -	2·50	0 19 9	0 8 5
Guano and sulphate of ammonia - - - - -	9·00	1 5 9	1 10 4
Nitrate only - - - - -	12·00	0 9 6	2 0 6
Sulphate only - - - - -	4·24	0 10 9	0 14 4
Nitrate and potash - - - - -	7·50	0 18 3	1 5 4
Super, nitrate, and potash - - - - -	10·00	1 7 3	1 13 9
Guano, nitrate, and potash - - - - -	7·74	1 13 0	1 6 2

Phosphatic manures and potash appear on the whole to have been useless—except, perhaps, in one case—but there are many inconsistencies in the results that are—as is unfortunately so often the case in field experiments—no doubt due to the irregularities in the natural yield of the plots themselves, apart from manuring. The best yield was that obtained in the plot manured with nitrate alone, which gave 12 bushels more than the higher of the unmanured plots at an outlay of only 10d. per bushel.

Samples of barley from each plot were submitted to several maltsters for inspection, all of whom considered that the variations in quality were inconsiderable. One large buyer of barley put the produce of one of the unmanured plots and of the superphosphate and nitrate plot first, and those of the sulphate only, and of the superphosphate, nitrate, and potash plots second. Another put the superphosphate and nitrate produce first, and that of superphosphate, nitrate, and potash second. The produce of the “nitrate only” plot, however, which yielded the largest increase of all, at 10d. per bushel, was not markedly inferior to any of the others.

(6.) THE ROYAL MANCHESTER, LIVERPOOL, AND NORTH
LANCASHIRE AGRICULTURAL SOCIETY.

(MR. SMITH AND MR. SMETHAM.)

MANURIAL EXPERIMENTS ON PERMANENT GRASS, Tatton Park,
Cheshire.

The whole of the plots from 1 to 16 were again dressed with manures similar to those applied in 1891, a list of which is attached hereto. It was not, however, thought desirable to dress plots 20 to 22, as the manures already sown are of a permanent character, and are not such as are usually repeated, except after the lapse of a number of years.

In the accompanying table particulars are given, not only of the weight of hay and of dry matter carried per acre from each plot in 1892, but also, for the sake of comparison, a copy of the results obtained in 1891.

It will be noticed that the weights in 1892 are considerably below the weights recorded in 1891. This, no doubt, is accounted for to a large extent, if not entirely, by the dryness of the early season, which affected the hay crop not only in the Society's district, but more seriously in the southern counties of England.

Contrary to what was experienced in 1891, the results from the two unmanured plots were considerably less than from any other individual plot; whereas in 1891 the weight of hay from the unmanured plots was greater than that from the plot which had been dressed with 4 tons of lime, while some of the plots dressed with bones, both boiled and raw, showed no increase.

In the case of plots 13 and 16, where the bones had the addition of nitrate of soda, the extra weight of hay carried in 1892 amply repays the cost of the manure; similar remarks may be made where the bones have been used alone, and also when used in conjunction with dried blood. These results compare most favourably with those from the same plots in 1891, when no substantial increase was obtained from any of the plots manured with bones. Doubtless the increased yield is very largely attributable to the previous year's application, the phosphate of the bones being only slowly decomposed in the soil.

It will be remembered that in 1891 all the plots manured with superphosphate and basic slag, either alone or in combination with nitrogenous manures, showed largely increased crops of hay, at a cost for the extra hay of from 1s. 3d. to 2s. per cwt. Last year, owing to the generally diminished yield of hay, these plots do not contrast so favourably with the results obtained in 1891, yet the extra bulk of hay carried amply repays the total cost spent in manures in 1892, the extra produce being obtained at a cost of 2s. 3d. to 2s. 9d. per cwt.

The most economical results, so far as the actual cost of the increased yield of hay is concerned, are shown in plots 3, 9, and 12; in the first, basic slag, kainit, and nitrate of soda, are used in conjunction, and on plot 9 superphosphate and dried blood were applied, dried blood being used alone on plot 12. These plots show an extra weight of hay produced over the unmanured plots, at a cost of 2s. 2d. per cwt., which, considering the price that that article has been sold at in 1892, gives a satisfactory return for the outlay. It will, however, be evident that that manure is really the most economical which by its use leaves the greatest profit to the farmer; and hence a greater yield, even at a greater cost

[illegible]

per cwt. of hay produced, may really be the most economical. Viewed in this light, plots 9, 3, 1, and 7 have respectively yielded the best results.

Comparing these results with those obtained in 1891, it will be noticed that climate affects the products of the land; and, although proper manures may be applied, the extent to which the crops will benefit will largely depend upon the proper distribution of rain and sunshine; indeed, it may be said that these last are the farmer's best friends in achieving success. But, nevertheless, much can be learnt from these experiments, as, in spite of what was undoubtedly an unfavourable hay season, an increased bulk was obtained by the best manures, at a price which left a wide margin of profit on the extra outlay, while the herbage has been very greatly improved. When, in addition, it is remembered that there is a considerable residue of unexhausted manure in the soil, the advantages of a rational manuring of grass land must surely be apparent.

As regards plots 20, 21, and 22, the two former of which were dressed with lime in 1891, and the latter with farmyard manure, the results of the two last are still unsatisfactory, and compare most unfavourably with the results obtained by the use of the artificial manures previously referred to. As, however, lime and farmyard manure are well known to exert a beneficial effect for a number of years, it is too early to make any just comparison between them and the more evanescent manures, such as superphosphate and nitrate of soda.

(7.) HIGHLAND AND AGRICULTURAL SOCIETY.

(DR. A. P. AITKEN.)

(a.) THE ECONOMICAL MANURING OF THE TURNIP CROP.

This experiment is a development of one which has for four years been tried by many agricultural associations in different parts of Scotland. Its object, as described on the schedules supplied to the experimenters, is threefold.

1. To compare the effect of bone meal, superphosphate, and Thomas' slag as phosphatic manures for the turnip crop, along with a definite amount of nitrate of soda.
2. To discover what proportion the nitrate of soda should bear to the phosphate.
3. To compare the effect of nitrate of soda with that of an equivalent amount of sulphate of ammonia.

These phosphates and nitrogenous manures were chosen because former experiments had shown that they were the cheapest and best materials wherewith to grow a crop of turnips.

The Society supplied, as usual, all the manures free of cost, and done up in bags carefully labelled and described, so that no error might occur in applying them each to its own plot. There were in all nine plots, each one-fortieth of an acre in area; and the quantities of manure per plot and per acre, and their cost per acre, are shown on the accompanying table:—

Plot.	Quantities of Manure.	Per Plot.	Per Acre.	Cost per Acre.
		lb. oz.	cwt.	s. d.
1.	Fine bone meal - - -	11 3	4	26 0
	Nitrate of soda - - -	0 11	$\frac{1}{2}$	
2.	Superphosphate - - -	16 12	6	26 0
	Nitrate of soda - - -	2 13	1	
3.	Thomas' slag - - -	25 0	9	26 0
	Nitrate of soda - - -	2 13	1	
4.	Mixed super and slag - -	21 0	$7\frac{1}{2}$	26 0
	Nitrate of soda - - -	2 13	1	
5.	Mixed super and slag - -	21 0	$7\frac{1}{2}$	35 0
	Nitrate of soda - - -	5 10	2	
6.	Fine bone meal - - -	11 3	4	26 0
	Sulphate of ammonia - -	0 9	$\frac{1}{3}$	
7.	Superphosphate - - -	16 12	6	26 0
	Sulphate of ammonia - -	2 4	$\frac{4}{5}$	
8.	Mixed super and slag - -	21 0	$7\frac{1}{2}$	17 0
9.	Nothing - - -	—	—	—

The manures are supplied in quantities required to bring them all to the same cost of 26s. per acre—a moderate cost for a turnip manure—except in the case of plot 5, which got a double dose of nitrate, and plot 8, which got none. The quantity of nitrate of soda and also of sulphate of ammonia given along with bone meal is only one-fourth of that applied to the other plots, because bone meal is itself a nitrogenous manure as well as a phosphatic one, and the amounts of nitrate and sulphate added to it on plots 1 and 6 are such as to make it on a par with plots 2 and 7, &c. as regards nitrogen.

On Table I. are shown the results at eight districts, at each of which six or more experiments were successfully carried out—three districts in Aberdeenshire, and one each in the other counties of Ross and Cromarty, Kincardine, East Lothian, Berwick, and Dumfries. There are also two results from Perthshire. Altogether about 60 farmers have succeeded in performing this experiment, in such a way as to give results worthy of recording for the solution of the questions proposed. There are, unfortunately, many others whose results are unreliable from a variety of causes, viz., attack of fly, finger-and-toe, rotting after frost, and accidents and inequalities of various kinds. Some of these failures, though they are of no use for the main purpose of the experiment, are most interesting from other points of view, and instructive to members of the associations who have seen them and discussed them, but they cannot be noticed here.

Taking the general results of the 61 experiments shown on this table, irrespective of local qualifying circumstances, it is seen that there is very little difference in effect between superphosphate and Thomas' slag, when applied at the rate of 6 cwt. and 9 cwt. per acre respectively, that is to say, in quantities of equal money value: and a mixture of the two in equal parts is just as good as either separately. Bone meal has shown itself to be distinctly inferior to the other two by 1 or 2 tons per acre, but that is a very considerable deficiency in a crop averaging $17\frac{1}{2}$ tons per acre. It is quite evident, however, that this deficiency must not be attributed entirely to the kind of phosphate. The results show quite clearly that it was to some extent the want of nitrogen in a rapidly available form that caused the deficiency in the bone meal plots. The character of the season is a very important factor in this case. The general character of 1892 was cold and dull in early summer, cool and dull thereafter, and dull and wet in autumn, not a good season on the whole, although here and there the crop grew very well. In most cases the circumstances were such as to favour those plots that had a fair dose of nitrate to give the crop a good start; and the want of a growthy October and November prevented those plots to which phosphatic and nitrogenous manures of a less active kind were applied from making up upon their rivals to the extent that they would have done had the weather been more favourable. The want of sunshine, and the general coldness during the first half of the season, is mainly responsible for the general smallness of the crop and the inefficiency of the nitrogenous manures. Sulphate of ammonia in the small quantity applied along with bone meal has done more for the crop than its equivalent of nitrate of soda. The dry cold weather in June was not favourable to the action of nitrate, and by the time that the warmer weather arrived there was probably very little of it left in the soil. When applied in larger quantity, along with superphosphate, it was more effective than the corresponding quantity of sulphate of ammonia, especially on the lighter class of soils. Where the soils were richer in organic matter, however, the sulphate of ammonia did rather better than the nitrate of soda; and this may be accounted for on the assumption that in the heavier soils containing more organic matter the nitrifying organism would be more abundant, and the conditions, especially as regards warmth, would be more favourable to its activity. It is a matter of common experience that sulphate of ammonia affects the growth of crops more slowly than nitrate of soda, and the reason of that seems to be that it has to be converted into nitrate by means of the nitrifying organism before it becomes available as a manure.

II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE. 101

The relative merits of nitrate of soda and sulphate of ammonia is a subject that is constantly being discussed, and deservedly so, for they are both very powerful and also very expensive manures. The fact that nitrate of soda is much more liable than sulphate of ammonia to be washed down through the soil and carried away by the drains during wet weather is well understood nowadays. This fact was very forcibly brought home to those who tried a similar experiment last year, but in 1891 the weather conditions were entirely different. Heavy floods, which occurred just after singling, washed away the most of the nitrate applied to the lighter class of soils. The inference which one naturally draws is that nitrate of soda is less profitably applied on light soils than on those that are heavier and more retentive. The results of last year's experiments, however, show that there is another side to the question. They show that, despite what may be called the greater solubility of nitrate of soda, it has suited the lighter soils better than the heavier ones, and that the question is not one to be decided upon the ground of solubility alone. The other side of the question will be apparent, if the fact is kept prominently before the mind that sulphate of ammonia has to be converted into nitrate before the plant can make use of it, and that this conversion has to be performed by a living organism, which is less abundant in light, sandy, and gravelly soils than in the heavier soils, and in those richer in organic matter. It is therefore expedient that a portion of the nitrogenous manure applied to light soils should be in the form of ready made nitrate, and of course this is especially advantageous in dry districts and during dry seasons, and also in cold seasons when the nitrifying organism is less active. Fortunately nitrate of soda is a manure that can be applied at any time when the conditions are considered favourable, and the farmer has it in his power to avoid undue loss from its application.

One very striking fact brought out by these experiments is that the application of nitrogenous manures to the turnip crops last year had very little effect upon the growth. Nitrate of soda, at the rate of 1 cwt. per acre, increased the crop by only about $1\frac{1}{2}$ tons per acre; and even when double that quantity was applied the average increase was under 2 tons. The smaller quantity barely repaid its cost, but the second cwt. was a dead loss. It produced an increase of only about 6 cwt. turnips per acre, and in all probability that increase was mainly due to water, and may have added almost nothing to the amount of actual fodder grown. During the month of August the effect of the heavier application was very visible in the amount of tops on plot 5, and gave promise of an abundant return for the increased outlay, but as the season advanced the growth ceased, and the other plots gradually overtook it.

The phosphates, mixed superphosphate and slag, applied alone at a cost of 17s. per acre, produced an average increase of nearly 5 tons per acre over the plot which got no manure; but there were great differences on the different farms in this respect. On some of the better kinds of land, even, the phosphates did not pay; while on the light and poor soils the want of phosphates resulted in absolute failure. Most of the experimenters selected their poorest fields for the experiments, and that very properly, for it was their desire to know how most economically to grow a fair crop on those parts of the farm where turnip-growing was least successful.

On some of the farms the manures were applied with and without dung, and it was found in most cases that the addition of the dung made

TABLE I.—AVERAGE RESULT obtained in EIGHT DISTRICTS throughout SCOTLAND.

No. of Plot	1.	2.	3.	4.	5.	6.	7.	8.	9.
Manures	Bone Meal. ½ Nitrate.	Super. Nitrate.	Slag. Nitrate.	Super and Slag. Nitrate.	Super and Slag. Double Nitrate.	Bone Meal. ½ Sulphate of Ammonia.	Super. Sulphate of Ammonia.	Super and Slag. —	Nothing.
	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.
1. Turriff, Aberdeenshire	11 15 2	15 13	16 13	16 14	16 16	14 12	14 17	14 1	7 0
2. Aberdeen, "	7 17 5	17 15	19 9	19 5	18 5	16 12	18 14	18 14	12 16
3. Strathbogie and Inverurie	7 15 18	18 1	18 7	18 9	18 7	16 16	17 1	16 10	9 3
4. Ross and Cromarty	7 16 1	18 2	17 11	18 13	18 16	16 5	17 18	17 8	14 6
5. Humber, East Lothian	6 14 10	18 6	17 17	17 3	18 7	16 6	18 4	16 19	13 7
6. Lauderdale, Berwickshire	8 11 9	14 1	14 0	13 16	15 15	12 3	13 14	11 19	9 0
7. Mid-Anandale, Dumfriesshire	8 15 11	17 12	16 4	17 14	18 19	17 4	16 1	16 0	12 6
8. Kincardineshire	7 17 4	17 14	18 13	18 2	16 13	17 14	17 14	17 0	—
Average of 61 experiments	— 15 7	17 3	17 7	17 9	17 15	15 19	16 13	16 1	11 3

only a slight increase in the crop; and on some farms where a comparison was made between the effect of the artificial and that of dung alone, the artificials had the best of it.

Keeping in view that the season was dull and cold, and that the autumn was wet, and that frost came early and was severe during the winter, and that no dung was applied to the turnip crop, the main results of these experiments may be shortly summed up as follows:—

1. Bone meal has not been so good a manure as slag and superphosphate, to which an equivalent quantity of nitrate of soda or sulphate of ammonia is added.

2. For bone meal, and also, though to a less extent, for slag, mild growing weather in autumn is required in order to produce a fair return for the expense of the manures.

3. A mixture of slag and superphosphate is a good safe phosphatic manure for promoting the growth of turnips, both in the early and later part of the season.

4. More than 1 cwt. of nitrate of soda per acre does not pay.

5. The result of applying 2 cwt. per acre of nitrate of soda is to produce an undue growth of tops, and to render the crop more liable to disease during winter frosts.

6. Nitrate of soda, though more liable than sulphate of ammonia to be washed down through the soil during a wet summer, when applied to light thin soils containing little organic matter, is more advantageous than sulphate of ammonia on such soils during a cold dry summer; and therefore it is expedient to apply to even the lightest soils a certain amount of nitrate of soda in a turnip manure.

7. Sulphate of ammonia is more active upon heavy than on light land, and exerts its influence chiefly in the latter part of the growing season.

8. The risk of damage to the turnip crop from recurring frosts during winter is so great, that in the average of seasons it will be found more economical to store turnips at the end of November.

9. Turnips that are pulled in the latter part of November and left in rows on the field with the bulbs covered with earth and only the tops exposed, do not suffer even during a severe winter, but may even increase in weight to some extent.

10. Dugging in the drills is a very expensive method of manuring turnips, and experiments are wanted to see if the ploughing in of dung on the turnip-break in the late autumn or early winter would not produce a safer and better crop.

(b.) The MANURING of TURNIPS with NITROGENOUS MANURES.

The object of this experiment is to test the relative merits of nitrate of soda and of sulphate of ammonia as a soluble nitrogenous manure for the turnip crop, and to discover the most advantageous way of applying them.

A similar experiment was tried in 1891, but its success was greatly interfered with by the wet weather. It was thought that a modification of that experiment during a different season might yield information of some value.

104 II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE.

The modification was as follows. A general turnip manure of the following composition formed the basis, viz. :—

	Cwt. per Acre.
Thomas' slag, at the rate of - - -	5
Fine bone meal „ - - -	1
Superphosphate „ - - -	1
Sulphate of potash „ - - -	1

This was a heavy dressing, but it was for application to land that had not been dug, and in most cases to land in poor condition. The above mixture was applied as a general manure to the plots under experiment.

To one-half of the plots nitrate of soda (120 lbs. per acre) was applied, and to the other half sulphate of ammonia in equivalent quantity (86 lbs. per acre). The former was called section A., and the latter section B, consisting each of five plots. To four plots on each section the nitrate and the sulphate respectively were applied at stated times, viz. :—

- Plot 1. The whole applied along with the seed.
- „ 2. The whole applied 10 days after singling.
- „ 3. The whole applied 6 weeks after singling.
- „ 4. One-half applied with the seed, and the other six weeks after singling.
- „ 5A. No nitrogenous manure at all, but only the general manure.
- „ 5B. No nitrogenous manure at all, but only the phosphates of the general manure.

The experiments were tried in six different districts, but at one of these (Ross and Cromarty) the results were few and not very reliable. The returns of the other five districts are summarised on the accompanying table.

It is evident that a satisfactory answer is given to the inquiry in so far as it is possible to answer it in one season. The nitrate of soda has a trifling advantage over the sulphate of ammonia as regards the weight of roots produced per acre, but the difference is not worth considering. On some soils the one was better and on others the other. A much more important thing than the actual weight of bulbs in this case is the fact recorded by many of the experimenters, that the section manured with sulphate of ammonia produced a sounder turnip than that manured with nitrate of soda. This is an important confirmation of the results obtained at the Society's experimental station at Pumphreston.

As regards the method of applying these two manures, it is shown that in a somewhat dry and certainly cold and backward season it is better to apply them at the time of putting in the seed. Nearly as good results have been got by applying them in two halves—the one half with the seed and the other at a later period. It is probable that if the second half had been applied a little earlier the result would have been better. Six weeks after singling, especially in a backward season, is too late. It was reported by many of the experimenters that plot 4 improved rapidly after the second application, and that it would probably have been the best plot of all if its progress had not been suddenly checked by the severe frost which occurred on 22nd September. But for that unfortunate circumstance the crop might have continued growing for three or four weeks. It would evidently have been better if the second

TABLE II.—GENERAL RESULTS.

Section A.—*Nitrate of Soda.*

No. of Plot	-	-	-	1.	2.	3.	4.	5.	6.
Time of Application	-	-	-	Along with Seed.	10 Days after Singing.	6 Weeks after Singing.	$\frac{1}{2}$ with Seed, $\frac{1}{2}$ 6 Weeks after Singing.	Phosphate and Potash only.	Nothing.
				No. of Experiments.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.	Tons cwt.
1. Vale of Alford	-	-	-	9	23 17	21 14	22 13	21 10	—
2. Turriff	-	-	-	8	20 7	19 0	20 9	17 12	—
3. Aberdour	-	-	-	7	18 1	17 14	18 13	16 9	—
4. Huntly and Inverurie	-	-	-	10	20 4	19 13	19 8	18 19	—
5. Mid-Anundale	-	-	-	8	18 16	16 17	17 7	19 2	—
Average of 42 experiments	-	-	-	—	19 1	19 0	19 14	18 14	—
Section B.— <i>Sulphate of Ammonia.</i>									
1. Vale of Alford	-	-	-	9	22 7	21 12	22 6	21 9	—
2. Turriff	-	-	-	8	19 10	18 16	17 7	16 2	9 8
3. Aberdour	-	-	-	7	19 10	17 18	19 1	17 6	10 10
4. Huntly and Inverurie	-	-	-	10	20 1	19 2	19 1	16 12	8 0
5. Mid-Anundale	-	-	-	8	18 7	18 0	17 8	16 14	13 2
Average of 42 experiments	-	-	-	—	19 19	19 2	19 7	17 12	12 0

application had been made a month instead of six weeks after singling. It was well into July before most of the plots were singled, so that the second application was in most cases made at the end of August. The middle of August would have been better, while the weather was still warm and the hours of daylight not yet much curtailed. It is very important that the nourishment at the roots of the crop should be abundant at the time when the conditions above-ground as regards light and heat are at their best. During the short days and low temperature of October and November there is very little of the sun's energy being stored in the turnip crop, even if no frost occurs to injure the plants and permanently disorganise their circulation, and it would be a prudent thing to regard the manufacture of food as finished by that time. The latter half of November should, if possible, find the crop all covered up and protected from injury; for it is pretty certain that any growth in December will be far more than balanced by the manifold damage sustained during the winter.

A subordinate part of the experiment is that shown on plot 5. It is shown that in most cases the addition of potash to a turnip crop that has got no farmyard manure is beneficial. But there is still wanted an experiment to show when it should be applied. It has had no good effect on many farms, but probably if it had been put on the land in autumn or winter it would have been of greater service.

(c.) THINNING OF TURNIPS.

At one of the meetings of farmers carrying out experiments with turnip manures, under the direction of the Chemical Committee of the Society, a discussion arose on the subject of singling, and it was apparent that considerable diversity of opinion existed as to the distance which should be left between the plants so as to produce the greatest amount of turnip food per acre. It was admitted that it was not a question to be decided from merely theoretical considerations, but that the heavier or lighter character of the land, the variety of turnip sown, the favourable or unfavourable nature of the season, and the prevalence of turnip-fly or other pest, would be important factors in determining what number of plants per acre would yield the best crop. Nevertheless, as it had been the custom in the district to adhere to a certain old-established system which might or might not be the best for general purposes, it was resolved to make some comparative trials on a small scale, as a preliminary to a larger investigation in future seasons.

Unfortunately the severe winter destroyed a number of the trials; but there are two from Aberdeenshire—at Mains of Laithers and Lessendrum—and one from Lauderdale at Boon, which deserve to be recorded.

The trials at Lessendrum and those at Mains of Laithers were carried out upon the same plan, both with swedes and yellows, and the results were as shown Tables I. and II.

The plants were thinned at four different distances apart—viz., 3, 6, 9, and 12 inches—in the first place with a single plant left as is usual, and in the second place with 2, 3, and 4 plants left growing in a clump. When the plants are thinned so as to leave two or more growing in a clump, they compete with each other for the nourishment of the soil, and produce very small bulbs, which are not such as to satisfy the eye of any one accustomed to value his crop by an estimate of the size of the

bulbs; but that is a sentiment which would soon disappear if it were found that the puny-looking 2, 3, or 4 bulbs contained more food material than the large one whose place they occupied. It is well known that very large bulbs lack solidity, and are frequently very spongy in texture towards the heart, and do not weigh so much per acre as their appearance would lead one to expect. Moreover, as the solid matter of a turnip is in great measure dependent on the amount of roots which it can spread into the soil, it seemed probable that several plants growing together would have a larger root development than one plant, and might be found to produce bulbs which contained a greater amount of fodder in less bulk than single bulbs could accumulate. That is clearly a matter for experiment; but the experiment should not end with the weighing of the crops, for it was proved at Pumpherston that one crop may be heavier than another and yet contain less solid matter, especially if the bulbs are very large. It would be necessary to know how much of the crop was water and how much was solid matter; and not only so, but also to know what the solid matter was composed of.

TABLE I.—LESSENDRUM.

Sown May 24, singled July 5, lifted February 9. Each plot consisted of five drills.
Plants counted and weighed on 38 feet 9 inches.

SWEDES.				
Soil, heavy loam.				
Plot.	—	No. left.	No. lifted.	Weight per Acre.
1	3 inches apart, single plants -	155	146	Tons cwt.
2	6 " " " -	76	76	16 10
3	9 " " " -	52	52	18 3
4	12 " " " -	38	38	20 17
5	3 " 2 plants together	310	244	17 13
6	6 " 2 " " -	155	144	13 5
7	9 " 3 " " -	155	152	16 5
8	12 " 4 " " -	155	140	12 5
				16 10

GREEN-TOP YELLOWS.				
Soil, alluvial sandy loam.				
1	3 inches apart, single plants -	155	140	15 8
2	6 " " " -	76	76	12 19
3	9 " " " -	52	52	18 10
4	12 " " " -	38	38	13 17
5	3 " 2 plants together	310	252	15 1
6	6 " 2 " " -	155	130	16 12
7	9 " 3 " " -	155	140	17 5
8	12 " 4 " " -	155	154	14 1

The only satisfactory way to determine the relative feeding value of bulbs grown in different ways is to make a careful feeding experiment, and note the progress made by the stock consuming them. Short of that perfect test some information may be derived from the analysis of the bulbs grown under different conditions. In a preliminary experiment done on a small scale this latter method was the only one available.

TABLE II.—MAINS OF LAITHERS.

Soil, rich loam on clay slate. Sown May 16, singled June 30, lifted January 26.

SWEDES.

Each plot consisted of five drills. Plants counted and weighed on 96 feet 8 inches.

Plot.	—	Calculated Number.	No. lifted.	Weight per Acre.
				Tons cwt.
1	3 inches apart, single plants -	387	333	21 3
2	6 " " " -	193	179	21 14
3	9 " " " -	129	123	22 17
4	12 " " " -	96	90	18 4
5	3 " 2 plants together	774	513	19 19
6	6 " 2 " " -	387	349	22 3
7	9 " 3 " " -	387	303	22 6
8	12 " 4 " " -	387	323	20 9

GREEN-TOP YELLOWS.

Each plot consisted of five drills. Plants counted and weighed on 144 feet.

1	3 inches apart, single plants -	576	488	18 16
2	6 " " " -	288	242	15 10
3	9 " " " -	192	167	15 1
4	12 " " " -	144	149	15 18
5	3 " 2 plants together	1,152	677	16 4
6	6 " 2 " " -	576	415	15 1
7	9 " 3 " " -	576	397	13 3
8	12 " 4 " " -	576	437	16 15

Accordingly the turnips were carefully sampled at Lessendrum and Mains of Laithers, and sent for analysis. The results of these analyses are given on Tables III. and IV. Before considering them, a few words are necessary regarding the progress and weights of the crops grown at the two places.

At Lessendrum, near Huntly, the conditions for turnip-growing were far more favourable than in most parts of the country, and the crop was uncommonly healthy. A comparison of the number of turnip plants left to grow and the number of bulbs lifted, shows that remarkably few plants succumbed to disease or accident. The greatest mortality was among the plants that were grown 3 inches apart, both among the swedes and the yellows. The first thing one notices is, that the heaviest crop has been got in both instances from the plots where the plants were singled 9 inches apart, but in other respects there are considerable discrepancies between the swedes and the corresponding yellows. The smallest crop of swedes was grown on plot 7, where clumps of three were left 9 inches apart, but the corresponding plot of yellows is the second best of the series. Again, plot 2 of the yellows, where the plants were singled 6 inches apart, is the worst of the series, but the corresponding plot in the swedes is the second best; yet in neither case was a single turnip awanting. These discrepancies lead one to suppose that if the experiments were tried on a larger scale the results would probably be different. The discrepancies are probably due to

TABLE III.—ANALYSES OF TURNIPS THINNED AT DIFFERENT DISTANCES APART. MAINS OF LAITHERS.

	1 1 at 3 inches.	2 1 at 6 inches.	3 1 at 9 inches.	4 1 at 12 inches.	5 2 at 3 inches.	6 2 at 6 inches.	7 3 at 9 inches.	8 4 at 12 inches.
SWEDES.								
Water	89.54	89.76	89.46	90.50	88.40	90.24	89.88	90.32
*Solids	10.46	10.24	10.54	9.60	11.60	9.76	10.12	9.68
Solids contained—	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Albumen	9.41	9.19	6.50	8.31	7.44	8.75	8.75	8.63
Amides, &c. (N x 6.25)	2.40	3.50	3.75	3.06	2.18	1.75	2.19	3.50
Carbohydrates, &c.	67.74	65.51	74.40	71.23	72.48	71.70	71.86	68.67
Woody fibre	14.75	15.50	9.15	10.60	12.00	11.90	11.70	16.00
Ash	5.70	6.30	5.95	6.80	5.90	5.90	5.50	6.30
* Containing sugar	100.00 4.6	100.00 5.0	100.00 4.3	100.00 4.1	100.00 7.0	100.00 5.8	100.00 5.1	100.00 5.0
YELLOW.								
Water	90.34	90.54	91.12	91.26	91.66	91.18	90.56	90.32
+Solids	9.66	9.46	8.88	8.74	8.44	8.82	9.44	9.68
Solids contained—	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Albumen	8.31	9.41	7.87	7.44	8.31	10.72	8.97	8.06
Amides, &c. (N x 6.25)	3.28	2.84	2.41	4.81	1.97	3.03	1.53	3.31
Carbohydrates, &c.	71.36	71.60	69.82	69.15	71.62	65.65	70.35	71.13
Woody fibre	9.05	8.35	11.20	10.40	10.70	11.40	11.20	10.00
Ash	8.00	7.80	8.70	8.20	7.40	9.20	7.95	7.50
+ Containing sugar	100.00 4.1	100.00 4.4	100.00 3.8	100.00 2.6	100.00 4.8	100.00 2.3	100.00 4.6	100.00 5.0

TABLE IV.—ANALYSES OF TURNIPS THINNED AT DIFFERENT DISTANCES APART. LESSENDRUM, HUNTLX.

	1 1 at 3 inches.	2 1 at 6 inches.	3 1 at 9 inches.	4 1 at 12 inches.	5 2 at 3 inches.	6 2 at 6 inches.	7 3 at 9 inches.	8 4 at 12 inches.
SWEEDES.								
Water	89.26	89.64	89.32	89.88	88.80	89.94	88.40	88.26
*Solids	10.74	10.06	10.68	10.62	11.70	11.03	11.60	11.44
Solids contained—	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Albumen	10.28	10.03	10.06	9.41	8.53	9.84	8.97	10.50
Amides, &c. (N × 6.25)	5.03	5.47	3.94	4.15	4.39	4.38	5.03	4.59
Carbohydrates, &c.	67.49	67.37	69.50	70.74	70.84	70.23	70.40	68.21
Woody fibre	10.20	10.30	9.50	9.00	9.60	9.40	9.10	10.00
Ash	7.00	6.80	7.00	6.70	6.55	6.15	6.50	6.70
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
* Containing sugar	6.1	6.0	6.0	5.7	6.5	7.9	7.6	6.0
YELLOW.								
Water	91.54	90.14	92.38	91.44	90.16	91.70	91.24	91.54
†Solids	8.46	9.86	7.62	8.56	9.84	8.30	8.76	8.46
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Solids contained—								
Albumen	9.02	10.05	11.37	11.81	11.37	10.60	11.81	10.72
Amides, &c. (N × 6.25)	4.38	6.70	6.13	5.03	4.82	5.25	4.38	5.25
Carbohydrates, &c.	67.70	63.55	62.90	63.16	63.91	64.25	63.76	64.53
Woody fibre	9.70	7.70	10.20	11.30	10.30	10.50	10.25	9.80
Ash	8.60	8.00	9.40	8.70	9.60	9.50	9.80	10.20
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
† Containing sugar	5.8	5.1	4.2	4.1	5.0	4.8	4.8	4.3

inequalities of soil, although the parts of the fields on which the thinning experiments were made were carefully selected as being the evenest. Each plot was 48 feet long and 5 drills broad, and the middle drill of each plot was selected for weighing and for analysis. In an experiment on a small scale that seems a fairly good arrangement, but over a breadth of 48 feet some five-drill plots would be more favourably placed as regards the drains than others, perhaps. It was noticed that where the turnips were growing in clumps of three or four, one bulb would take the lead and grow for a while at the expense of the others; and though it ceased growing after attaining a moderate size, it retained its superiority over the others to the end.

At Mains of Lathers the number of plants in the plots having the largest number of turnips was considerably under the theoretical number. The reason of this was that although 4 lbs. of good seed was sown in the case of the swedes, and 3 lbs. per acre in the case of the yellows, when large enough for thinning, a sufficient number of plants in the proper places was not to be found, and the largest possible number available was left. To secure a sufficiency of plants for some of the plots, at least 5 or 6 lbs. of seed per acre must be sown. The plants all remained perfectly vigorous and healthy until the severe frost in the end of December, and although somewhat injured by frost none of the bulbs, unless one or two injured by game, rotted. The plots having the largest number of plants remained much greener in the tops after the frost than those wider apart, and consequently with larger bulbs, but otherwise the smaller plants seemed to have sustained almost as much injury as the larger.

At Mains of Laithers, as at Lessendrum, the swedes singled 9 inches apart produced the largest crop, but on plots 6 and 7, where two and three plants were left at 6 and 9 inches apart respectively, the weights of bulbs per acre were not far behind them; but in the case of the yellows the closest grown turnips produced the heaviest crops on both farms.

The experiment carried out at Boon on a smaller scale than those in Aberdeenshire gave the following results:—

					Weight in 10 Yards.	
					Stones.	lbs.
4 inches apart, single plant	-	-	-	-	7	7
5 " "	-	-	-	-	7	5
6 " "	-	-	-	-	6	5
7 " "	-	-	-	-	6	3
8 " "	-	-	-	-	6	7
9 " "	-	-	-	-	6	0
10 " "	-	-	-	-	5	13
10 " 2 plants together	-	-	-	-	8	4
10 " 3 "	-	-	-	-	8	7
10 " 4 "	-	-	-	-	7	7

In this case the weighings are very markedly in favour of the closely grown turnips; and, taking the whole results into consideration, it is evident that it is quite an open question whether the usual method of thinning turnips is the one which produces the heaviest crops, and that a more extended trial is wanted in order to discover what is the system of thinning by means of which the best results can be attained.

We may now consider shortly the data provided by the analyses of the turnips grown on the various plots in Aberdeenshire.

112 II.—EXPERIMENTS AIDED BY BOARD OF AGRICULTURE.

It would evidently be inexpedient to attach great importance to those analyses, considering the limited nature of the experiment, but a general survey of the figures brings out one or two points which are worthy of consideration.

In the first place the per-centage of solids in the closely grown turnips on plots 1, 5, 6, 7, and 8, is greater than that of the more widely grown turnips on plots 2, 3, and 4 all over; and if we consider, not the weight of the crop lifted, but the weight of solid turnip-matter grown, we find that in three out of the four experiments the advantage rests with the closely grown turnips.

In the next place we see that the composition of the solids does not vary very much in the large and small turnips. It might have been expected that the small bulbs would have been much more woody than the large ones, but upon the whole there is very little difference. The amount of albumen in the larger turnips at Lessendrum is rather more than in the small ones, but at Mains of Laithers the reverse is the case. But the most noteworthy fact brought out by these analyses is that in every case the per-centage of sugar contained in the closely grown turnips is considerably greater than that in the more widely grown ones.

The averages are as follows:—

PER-CENTAGES OF SUGAR.

	Closely thinned Turnips. Plots 1, 5, 6, 7, 8.	Widely thinned Turnips. Plots 2, 3, 4.
Lessendrum—		
Swedes - - -	6·8	5·9
Yellows - - -	5·0	4·5
Laithers—		
Swedes - - -	5·5	4·6
Yellows - - -	4·2	3·6
Mean - - -	5·3	4·6

Another noteworthy result is seen on comparing the proportions of amides and other nitrogenous non-albuminoid constituents in the small closely thinned turnips and in the larger and widely thinned ones, viz.:—

NON-ALBUMINOID NITROGENOUS CONSTITUENTS—PER CENT.

	Closely thinned Turnips. Plots 1, 5, 6, 7, 8.	Widely thinned Turnips. Plots 2, 3, 4.
Lessendrum—		
Swedes - - -	4·68	4·51
Yellows - - -	4·81	5·57
Laithers—		
Swedes - - -	2·40	3·44
Yellows - - -	2·62	3·49
Mean - - -	3·63	4·25

These nitrogenous substances consist for the most part of amides, which are compounds that are converted into albumen as the plants become more mature.

As the turnip matures, not only do the amides become more and more transformed into albumen, but the carbohydrates become more and more converted into sugar; and as the closer thinned and smaller turnips contained a larger per-centage of sugar and a smaller per-centage of amides than the larger and wider thinned ones, there is justification for concluding that they were riper. If that fact is borne out by similar experiments done on a larger scale, it is evidently one of no little importance; for early ripening, if consistent with the obtaining of a full crop, is especially valuable in the case of the turnip crop, which suffers more than others from injury in the late autumn. Another important point which has not been tested in this preliminary trial, but which ought to receive attention when a larger experiment is undertaken, is the relative keeping qualities of turnips thinned in different ways and lifted at different times. Any method of cultivation that will have the effect of causing turnips to ripen earlier, and to keep better through the winter, would be a great boon to farmers, who spend and lose more money on the turnip crop than on any other crop they grow.

(S.) AGRICULTURAL RESEARCH ASSOCIATION FOR THE NORTH-EASTERN COUNTIES OF SCOTLAND.

(MR. THOS. JAMIESON.)

With the view of making the experimental work as useful to the practice of agriculture as possible, it has been suggested that a short and simple account of some of the information got during recent years, might acceptably be given in handy form, that might most readily be taken advantage of.

In response, therefore, to the suggestion, a general outline is given of some of the past results.

MARCH.—*Grass should be manured. The following mixture is recommended:—1 cwt. nitrate of soda, $\frac{1}{2}$ cwt. nitrate of potash, $\frac{1}{2}$ cwt. superphosphate, $\frac{1}{2}$ cwt. steamed bone flour per acre.*

This mixture, which would cost about 16s. to 18s. for the 2 cwt. to be given to an acre, *has been found to give, as a rule, about 15 cwt. additional hay per acre.* The value of this extra produce might be put at four or five times the outlay on the manure. The increase is not fully got if the season is unsuitable, but in that case the manure being in the midst of growing roots, is most likely to remain for use later on. It is advised to give this mixture on 2nd year's grass also (unless the soil is in unusually good condition), because the soil being filled with a close network of the roots of growing plants, none of the manure is likely to be lost. The 2nd year's grass plants seem in many cases to be half-starved.

APRIL.—*Best month for sowing grass and clover.*

The results of sowing in May and June were, as a rule, behind the April sowing. Sowing in July, August, or September was most unsatisfactory, except in the case of Timothy grass. That grass succeeded well in each of six sowings from April to September, and though the August and September sowings did little in the year of sowing, they turned out well in the following year; the September sowing, indeed, standing at the head of the list. *April, however, seems, on the whole, to be the month that best provides the moisture and moderate warmth necessary for germination.*

The best depth to sow appears to be as follows:—Grasses 1 inch, clovers, $\frac{1}{2}$ inch.

This, however, is on the assumption of suitable cultivation, i.e., the soil being well pulverised before sowing and rolled close after sowing. *Clover sown at 1 and $1\frac{1}{2}$ inches often does not reach the surface, or forms a backward or weakly plant. Sowing grass and clover seeds together is therefore likely to result in a deficiency of clover.* The nearer the surface consistent with the maintenance of sufficient moisture, the better; hence in a close soil the seed may be less deeply covered than in an open one. The method found satisfactory is to sow the grain (oats or barley) alone; to harrow twice (or till soil pulverised); to sow grass seeds and harrow once; then to sow clover and cover by chain harrow; then to roll *immediately*. It is felt that immediate rolling is essential, and that rolling might also usefully precede the grass sowing.

The best depth to sow oats and barley is considered to be $1\frac{1}{2}$ inches.

This, however, would vary with the soil. It has been found that on loamy soil the cereal seed manages to send up its leaf though deposited 6, even 9, and occasionally when even 12 inches down, but *the resulting plant is late and usually weak*, though not always so. Sowing on rough ground, being practically sowing at different depths, is likely to produce a crop unequal in rate of growth and probably in ultimate produce.

Character of seed to sow.—The heaviest seeds give the earliest braird and the largest crop.

The lighter seeds did not fall greatly short in the per-centage that succeed to germinate, but the plants were later and weaker. A mixture of light and heavy seeds would therefore give a crop similar to that produced by sowing on rough ground, i.e., an unequal crop both as to rate of growth and ultimate produce; while, besides, as the light seeds do actually germinate, the weakly plants produced interfere with the full development of the stronger plants from the stronger seeds. It seems advisable, therefore, to sift out the small seeds and use them for feeding.

Oats and barley are recommended to be manured as follows:— $\frac{1}{4}$ cwt. steamed bone flour, 1 cwt. superphosphate, 1 cwt. nitrate of soda, $\frac{1}{4}$ cwt. nitrate of potash.

Grass seed mixture recommended meantime is as follows:—

Lbs. per Acre.		Lbs. per Acre.	
Perennial rye -	15	Clovers {	English red - 3
Italian rye -	5		Cow grass - 2
Cocksfoot -	4		White clover - 1
Meadow fescue -	$1\frac{1}{2}$		Dutch do. - 1
Tall fescue -	$1\frac{1}{2}$		Yellow do. - 1
Poa trivialis -	1		
Dogstail -	1		

"Best seed" should be ordered, with guaranteed per-centage of germination.

The great advantage of Cocksfoot and Fescue (as given in the mixture) is *that they are fresh, and growing just at the period of the year (midsummer) when rye is backward.* There are other reasons for recommending them, but it is desired to give prominence to this one by stating it alone.

Cocksfoot grass alone.

An acre or so sown out with this grass alone would be found most productive and convenient. The only caution is to keep it well down—never to let it over 6 inches or thereby.

LINT.—*Sow 1 acre to every 100 acres— $1\frac{1}{2}$ bushels per acre (seed not black nor grey, but rich brown, plump, and glossy). Manure:— $1\frac{1}{2}$ cwt. superphosphate, 2 cwt. slog, $\frac{1}{2}$ cwt. steamed bone flour, $\frac{1}{2}$ cwt. nitrate of soda, $\frac{1}{4}$ cwt. nitrate of potash.*

Of the many plants tried, only three are recommended as suitable for this climate, as useful, easily cultivated, and profitable; they are Lint,

Lucerne, and Serradella. Lint may be sown when the pressure of the oat and grass seed sowing is over. There is no profitable local outlet for the valuable stem of lint. The oily seed, however, is most valuable for feeding, and its production would render the purchase of linseed cake unnecessary. Lint produces about 20 bushels seed per acre, which would provide the oil of about 2 tons of linseed cake (of 10 to 12 per cent. oil)—a greater quantity than the farmer of 100 acres is likely to purchase. The cultivation is easy, and the climate is suitable. A clean acre of the turnip break would be well cultivated in dry state, and in dry weather, and manured; harrow till a fine seed-bed is produced and the ground is almost flat, sow seed, going over the ground twice, covering in with very light chain or grass seed harrows, the seed to be covered only about $\frac{1}{4}$ of an inch, and then the ground heavily rolled. The seed is most sensitive to moisture, the soil should therefore be quite friable in working.

MAY.—*Lucerne*.—Sow 1 acre for every 100 acres: 10 lbs. seed per acre. *Artificial manure, same as for turnips, or rather more, with a good heavy dose of dung.*

This most valuable fodder plant is a perennial. One sowing will give two or three cuttings yearly throughout the whole rotation, and just at that period of the year—midsummer and autumn—when food is scarce. It is a nutritious, clovery-like plant, and cattle eat it readily. To grow it well, each plant requires plenty of space, and the ground is apt to be weedy the first year. This being the case it is recommended in the meantime to cultivate it exactly as is done in the case of turnips—dunging and manuring in the same way, making the drills as narrow as possible, sowing with the turnip sowing machine, thinning out like turnips, about 7 inches apart. As the crop is to remain during the whole rotation, it would occupy conveniently any outlying portion of good deep soil in the turnip break that might easily be fenced off; or it may form a certain number of drills along one side of a field. This, and the following plant, might be sown early in May, before the pressure of the turnip sowing commences.

Serradella.—Sow $\frac{1}{20}$ acre meantime, using 1 lb. seed, sowing thinly near surface, and roll well. *Manure, same as for turnips.*

This plant differs from Lucerne in being an annual plant, and in being very small for a long time. *It grows, however, rapidly in August and September, when it forms a dense mass of fine, succulent, clovery-like produce which animals eat readily. In the meantime it is recommended to be treated as for Lucerne, that is to say, exactly in the same way as turnips. The crop will be a failure unless each plant has plenty of space. The only difficulty will be in thinning-out, because the plant is so inconspicuous in the early stage—like a minute tare leaf. In the event of this difficulty arising, a clump might be left at each 6 or 7 inches, when proper thinning might be practicable at the second hoeing. Till familiarity with the plant and its cultivation is gained, it is recommended to sow only a small area.*

MAY AND JUNE.—*Turnips*.—*Manure*:—1 cwt. steamed bone flour, 2 cwt. ground coprolite, 2 cwt. slag, $\frac{1}{2}$ cwt. nitrate of soda, $\frac{1}{2}$ cwt. nitrate of potash, 15 tons farmyard manure.

The method of treatment of this crop is so well known, and in most respects so suitable, that few modifications are recommended.

They are:—

Manuring.

1st. *To avoid using manures that have been treated with sulphuric acid* (such as superphosphate, dissolved bones, and the usual mixtures termed turnip manures, unless they are guaranteed to be free of *dissolved materials*), for the reason that they have been found to give rise to finger and toe disease.

This year another, and, perhaps, serious objection to the use of dissolved manures has to be stated. It has been found that *every one of 14 samples of superphosphate tested, contained the poison—arsenic—*and, though the poison has not yet been traced into the plant, it seems unwise to expose animals to the risk of suffering from this poison, especially as it is quite unnecessary, seeing that finely divided *undissolved* phosphates produce, as a rule, practically the same or better crops.

Sowing.

2nd. *To sow the seed only about $\frac{1}{4}$ inch deep* (or a little deeper in the case of light soils). It has been found that *deeper sowing usually gives a weakly braird*, and it is considered that unequal and sluggish brairding may frequently be due to an uneven and lumpy state of the drills, by which the seed is deposited at unequal depths, and usually rather too deep.

Running.

3rd. It has been found that *a much larger proportion of the rooty fibres of turnips is spread near the surface* than is perhaps generally supposed, and it is considered well, therefore, to caution, in running turnips, not to go deeper than the surface half-inch or inch.

Thinning.

4th. *It has been found that the heaviest crops per acre are got by thinning out to only six or seven inches apart.* The turnips grown so close are often smaller, and give the impression of a smaller crop, but every yard gives six bulbs by the six inch method, against only four bulbs by the nine inch method, while these four bulbs usually weigh less than the six bulbs. Besides, the large bulbs are often found to be hollow-hearted or spongy, and almost always to contain a larger proportion of water. The delusive character of a crop of large watery bulbs may be shown by the following simple calculation:—

	Large Bulbs may contain in 100 Parts.	Small Bulbs may contain in 100 Parts.
Water - - - - -	92	88
Solid nourishing matter - - -	8	12

Therefore, a crop of 25 tons of *large* bulbs is equal to two tons nourishing matter; while a crop of 25 tons of *small* bulbs is equal to three tons nourishing matter. In other words, the small bulb crop is, on the above assumption, 50 per cent. more nourishing. These figures are given merely as an illustration; it is not intended to imply that this is the exact proportion, or that it usually holds good to such an

exient, but that this is *the general direction of the difference between large and small bulbs.*

JUNE AND JULY.—*Hay Harvest.*

No precise data have been sought in regard to the proper period for cutting hay, but it seems obvious that it should be cut much earlier than is usual. Once the seed is formed, and long before it may be shed by a stroke of the hand, a condition has been reached in which the hay will lose its seed in haymaking. The most nourishing portion of the plant has gone to the seed, so that to permit the seed to form and then to shed it on the ground, seems to be growing a crop for the sake of mere woody fibre, of which the stem is largely composed. The seeds shed on the surface of the ground in midsummer will do little good. They may germinate, but for the most part will form only weakly surface plants to be killed by the frost. It seems that *the hay should be cut before the seed has been fully formed*—namely, when the plant is in flower, or close after the period when a shake by the hand produces a cloud of pollen or flower dust. Hay cut at that stage may be deficient in clover, but that is a deficiency that will be made up in the aftermath, or in the following year.

JULY.—*Lint Harvest.*

One hundred days is about the period of growth of the lint plant. No novel plan need be taken, and little trouble need be anticipated. *The crop may be treated almost exactly as an oat crop*, weeded or not as desired, pulled or cut as desired when the stem is yellow half-way up, harvested like oats, threshed by flail or ordinary threshing-mill, bruised in any convenient way with or without the seed-vessels, and given to cattle in small quantities in a mash.

AUGUST AND SEPTEMBER.—*Harvesting of Grain Crop.*

It appears, although it is not conclusively proved, that *grain crops may safely be cut much earlier than is usual.* It is well known that when lint is pulled when the stem is yellow only half-way up, and dried in air, the greenish pods produce fully ripened glossy-brown seeds with full germinating power. So far as experiments have gone, the same seems to be the case with oats and barley. It seems unnecessary, therefore, to wait till the head or even the upper portion of the stalk is yellow. It will be obvious that more profit might thus be gained, while there would be much less exposure to the severities of the weather towards the end of the season.

OCTOBER.—*Ploughing.*

Ploughing by the common system causes heights and hollows by the feerings and midrigs. It necessitates endrigs, which are much trampled and frequently puddled. The turnings are many and awkward, and use up time. These defects are avoided by ploughing round the field, either commencing at the centre and working towards the outside, or commencing at the outside and working towards the centre. In the latter case two lines from corner to corner are left unploughed for turning on. By the common swing plough only about 8 inches broad can be turned over. By the Oliver Chill Plough, or the many imitations of it, about 14 inches can be turned over. An 18 acre field was ploughed at the rate of 1 acre in $4\frac{3}{4}$ hours. Although about double the work is thus done, the draught on the horses is only about one-half that of the swing plough, due to the latter having a convex board, which increases the

friction, while the chilled plough has a concave board. So far as experiments have gone, the resulting crops after the two different ploughs seem to be practically identical.

NOVEMBER.—*Turnip Storing.*

It is almost impossible to store all the turnip crop before the end of the year. It is often impracticable to store even the greater part of it, but it seems that a *greater effort should be made than is usual to store them in November*, even though the ploughing should be deferred for this purpose. The turnip land is probably much injured, to the hurt of the following grain crop, by the puddling due to carting turnips in wet weather during winter and early spring, while the scarcity of food during storms is frequent. It is generally considered that swedes grow during winter. The extent of growth has not been determined, but it is thought likely to fall much short of the loss that is frequently sustained by frost, &c. As, sooner or later, the turnips have to be carted to the steading, it seems desirable to do so in November. Several methods of storing have been tried, such as:—

- (1.) Furrowing up;
- (2.) Putting four drills into two and ploughing over;
- (3.) *Putting into heaps of two or three loads, and throwing over only about a couple of inches of soil.*

The last-mentioned method was distinctly the best, and it seemed to be immaterial whether or not the turnips were topped and tailed.

TEN YEAR ROTATION.

Long, healthy interval between the turnip crops.

Abundant fodder in autumn.

Grain and grass crop area same as on sixth shift.

The difficulty of saving the turnip crop would be lessened by lessening the area in that crop, and giving a gradually increasing area to other crops, especially to legumes, such as Lucerne, tares, &c.

It is believed that *by proper methods, five years in grass is practicable on most soils, even on those deemed unsuited for this*. Such a plan would demand less labour, would give the same area in grass as the sixth rotation, and about the same area in grain crop as the sixth rotation. It would provide abundance of autumn and winter fodder, a sufficient area in turnips, and, there being an interval of 10 years between the turnip crops, freedom from disease is almost ensured, and the lea broken up, being five years old, ensures a good grain crop.

An illustration of this rotation forms part of the present experiments. It is now in the third year, and each of the three breaks of grass bids fair to retain its satisfactory state till the fifth year.

III. |

**Report on the Special Class for Dairy
Teachers, held at the University Col-
lege, Bangor, in February 1893.**

III.—REPORT ON THE SPECIAL CLASS FOR DAIRY TEACHERS.

It was felt by the Board of Agriculture that advantage would probably accrue to the cause of education in matters relating to dairying throughout the country, if at some suitable centre provision were made for a short course of instruction for dairy demonstrators of the higher class; such instruction to be of an advanced character, and to comprise amongst other subjects a short course of lectures on the management of a dairy farm. It was believed that dairy demonstrators themselves urgently felt the need of such a course, and it was anticipated that, if successful, it might only be the first of a series of courses of a similar nature, held at different chief centres, which should aim at laying the foundation of a system of education in the higher branches of dairying which might eventually develop into a more complete scheme of this nature than anything yet attempted in this country.

As it was obvious that a course of the above nature could only be conducted at an educational centre already equipped with the necessary appliances and machinery, and possessed of a staff qualified to carry out all but the more purely specialised portions of the instruction proposed to be given, the Board approached the University College of North Wales at Bangor, as the first of the University Colleges to form an agricultural department, with the view of learning whether the authorities of that College would be willing to undertake the organisation of such a class. To this the authorities readily assented, and notification was subsequently made to the different county councils in Great Britain (and to certain institutions conducting dairy instruction for them), that the course would be held, and that any person engaged in teaching butter or cheese-making for them during 1892 would be eligible to attend. The Board further notified to these bodies that the tuition given would be free, the cost of providing it being borne by the Board. It was decided to limit the number of those who should be allowed to attend the course to 25, but three times that number of persons eventually applied for admission to the class, either through the council or society employing them or by direct personal application.

Eventually, with a view of distributing the benefits of the class over as wide an area as possible, the Board decided to admit to the class teachers who had recently been engaged in the following districts:—

Ayrshire.	Lancashire.
Berkshire.	Mid Wales (2).
Carnarvonshire.	Monmouthshire.
Cumberland.	Montgomeryshire.
Derbyshire.	Norfolk.
Dumfriesshire.	Northumberland.
Durham.	Oxfordshire.
Flintshire.	Staffordshire.
Forfarshire.	Surrey.
Hampshire.	Warwickshire.
Yorkshire (North Riding).	
District covered by Bath and West of England Society (2).	
District covered by Eastern Counties Dairy Institute.	

The class assembled on 6th February, and although some members may, before they actually arrived at the College, have doubted as to what particular benefits they would be likely to derive from the course, a few days instruction completely removed those doubts, and the class as a whole was not slow to realise that there was now opened for them a field of useful study, of the very existence of which they had previously been totally unaware.

The subjects of instruction comprised in the course were as follows:—

1.—ON THE ELEMENTS OF CHEMISTRY IN RELATION TO DAIRYING.
(Mr. F. J. Lloyd, F.C.S., F.I.C.)

1. Matter: its forms, properties, and composition; the influence thereon of natural forces.
2. Atmosphere: its composition and properties. Oxygen, nitrogen, water, hydrogen, ammonia, and sulphur.
3. Mineral matters. Limestone. Magnesia. Bones and their constituents.
4. Carbon compounds. Substances containing carbon, hydrogen, and oxygen only. Starch, sugar, &c.
5. Carbon compounds (*continued*). Fats. Substances containing nitrogen, &c. Glutin. Albumin. Casein and the albuminoids.
6. The chemistry of milk. The physical properties of milk.
7. The chemistry of milk (*continued*). The chemical constituents of milk, and the analysis of milk.
8. The chemistry of butter. Its composition and properties.
9. The chemistry of cheese. Rennet. The composition of cheese and the chemical changes which take place in its manufacture.

DEMONSTRATIONS GIVEN IN CONNECTION WITH ABOVE LECTURES.

1. *Milk*.—Methods of testing the acidity. The determination of specific gravity by lactometer and by weight. The separation of casein, albumen, sugar, and mineral matters, and their properties. The determination of solids, fat, and other constituents.
2. *Butter*.—The analysis of butter, and separation of water, fat, casein, mineral matter, and salt therein. The structure of the fat, and its constituents. Separation of the soluble and insoluble volatile fatty acids, and of the soluble and insoluble non-volatile fatty acids.
3. *Rennet*.—How to test its strength. How its action is affected by heat, acidity, &c. The changes which it produces. The properties of curd, and the influence thereon of heat, acidity, &c.

II.—ON BOTANY.

(Prof. Phillips, M.A., B.Sc., London.)

1. Composition of plant substance. Elements and compounds found in plants. Proteids, fats, and carbohydrates. Plant food. Contrast with food of animals. Composition of ash of plants.
2. Absorption from the soil. Water culture. Root and root hair. Ascent of sap. Transpiration. Drainage. Rotation.
3. Absorption from the air. Leaf structure. Chlorophyll. Influence of light. Fungi. Effects of overcrowding.
4. Formation of new organic substance. Appearance of starch. Transference of nutriment. Ferment action. Diastase.
5. Storage of nutriment in seed and elsewhere. Seeds—starchy and oily, albuminous and exalbuminous. Roots, tubers, bulbs

6. Root. Shoot leaf. Structure of apex of shoot and root. Branching. The flower. Sepals. Petals. Stamens and carpels. Cohesion and adhesion.
7. Classification of flowering plants. Monocotyledons and dicotyledons. Natural orders. Genera. Species. Cultivated varieties.
8. Orders containing plants of economic importance. Cruciferae. Rosaceae. Leguminosae, and their root tubercles. Umbelliferae. Cross-fertilisation by insects.
9. Gramineae. Cereals and fodder plants. Structure of a grain of wheat. Cross-fertilisation by agency of the wind.
10. Other plants of economic importance. Potato. Beet. Mangel-wurzel. Isolated plants containing sapid substances detectable in milk.

III.—ON DAIRY FARMING.

(Mr. D. A. Gilchrist, B.Sc., Edin.)

1. Surface geology. Soils and cultivation.
2. Natural and artificial manures.
3. Management of crops on a dairy farm.
4. Management of hay and pasture land.
5. Farm live stock. Distinctive characteristics of the different breeds of cattle.
6. Choice and management of dairy cattle.
7. Feeding of farm live stock. Economical use of home-grown and purchased foods.
8. Feeding of calves, of young cattle, and of dairy cattle.
9. Feeding of fattening cattle. Breeds of pigs. Feeding and management.
10. Sanitary arrangements of a dairy farm. Different systems of dairying, and their comparative returns.
11. Milk; its production, composition, and properties. Causes of variation in quality. Advantages of a dairy register.
12. Cream and its separation from milk. Ripening of milk or cream. Conditions to be observed in churning.
13. Preparation of butter for the market. Causes which tend to produce rancid butter. Butter colour.
14. Cheese-making. Rennet and its action. Development and control of acidity. Different systems.
15. Cheese-making. Different systems (*continued*). Adulteration of dairy produce. Stocking of a dairy farm.

IV.—ON BACTERIOLOGY.

(Dr. Griffith Evans, M.R.C.V.S., &c.)

1. Place of bacteria in the vegetable kingdom; their form and structure.
2. Mode of growth and propagation of bacteria; their purpose in the general economy of nature for good; their relation to health and disease.
3. Relation of bacteria to the earth, the air, the water, and human food. Specific bacteria found in milk. Bacteria of sour milk.
4. Disease-causing bacteria found in milk. Infectious diseases known to have been spread by milk from infected houses.

5. General description of the methods of pure cultivation of bacteria.
 "Bacteria Garden."

V.—DEMONSTRATIONS IN CHEMISTRY.

(Mr. C. F. Archibald, M.R.A.S.E.)

1. Weights and measures. Specific gravity.
2. Indestructibility of matter. Forms of matter.
3. Mechanical methods of separation.
4. Chemical methods of separation.
5. Oxygen and hydrogen.
6. Water.
7. Acids and bases.
8. Volumetric analysis.
9. Phosphoric acid.

For purposes of convenience the class was divided into 2 sections, A. and B., and the following is the manner in which the time of each section was occupied :—

Time.	Day.	Section A.	Section B.
1st and 2nd Weeks.			
9-10	Monday to Friday	Lecture on botany - -	Lecture on botany.
9-10.30	Saturday - -	Chemical laboratory - -	Soft cheese-making.
10-12	Monday and Tuesday.	Soft cheese-making - -	Soft cheese-making.
	Wednesday to Friday.	Lecture demonstration on chemistry of dairying.	Lecture demonstration on chemistry of dairying.
10.30-12	Saturday - -	Soft cheese-making - -	Chemical laboratory.
12-1	Monday to Friday	Lecture on dairy farming -	Lecture on dairy farming.
2-5	Monday and Wednesday.	Chemical laboratory - -	Soft cheese-making.
	Tuesday and Thursday.	Soft cheese-making - -	Chemical laboratory.
	Friday - -	Soft cheese-making - -	Soft cheese-making.
3rd Week.			
9-11	Monday and Tuesday.	Soft cheese-making - -	Soft cheese-making.
	Wednesday to Friday.	Lecture demonstration on chemistry of dairying.	Lecture demonstration on chemistry of dairying.
11-12	Monday to Friday	Lecture on bacteriology -	Lecture on bacteriology.
9-12	Saturday - -	Same as first and second weeks.	
12-1	Monday to Friday	Lecture on dairy farming -	Lecture on dairy farming.
2-5	Monday to Friday	Same as first and second weeks.	

It will thus be seen that the number of hours occupied in instruction each week was—

Lectures and lecture demonstrations	-	16	hours per week.
Chemical laboratory	- - -	7½	" "
Soft cheese-making	- - -	14½	" "

Instruction in the last-mentioned subject was given by Mr. John Benson, Manager of the British Dairy Institute, Aylesbury, and thanks are due to the Council of the British Dairy Farmers' Association for thus allowing his services to be made use of, involving, as this did, his

absence from the Institute for 3 weeks. The cheeses whose method of manufacture were demonstrated by him were as follows :—

Name of Cheese.	No. of lbs. of Milk for each Cheese.	Weight of Cheese.	Price.	
			Whole-sale.	Retail.
Camembert - - - -	4½ lbs.	11 oz.	6d.	7d.
Coulommiers - - - -	5 lbs.	1 lb.	6d.	8d.
Port du Salut - - - -	5 galls.	5½ lbs.	10d. lb.	1s. lb.
Pont l'Evêque - - - -	8 lbs.	1 lb.	8d.	9d.
Gorgonzola - - - -	10 galls.	about 12 lbs.	8d. lb.	10d. lb.

while the following is a short account of the way in which they may be made.

Camembert.—A French cheese made from whole or partially skimmed milk. It is very fine and delicate in flavour when well made, and greatly in demand at all seasons. The flavour depends on the successful growth on the outside of the cheese of a fine pilose mould—which is first white and then blue—the mycelium of which penetrates into the interior of the cheese and causes a change in its body equivalent to ripening. It is ripe in about 4 weeks.

Coulommiers.—A whole milk cheese sold fresh, or at least within 10 days of manufacture. It sells readily during the summer months, and will return about 1s. per gallon for the milk used. Coagulation is protracted, and ripening really takes place before the curd is ladled out into the forms.

Port du Salut.—A semi-hard cheese, subjected to slight pressure. It is very easily made, and ripens in about 6 weeks. It resembles a Gruyère in taste, but is milder.

Pont l'Evêque is somewhat similar to the last, but is smaller and square in shape. The body of this cheese, when ripe, is soft and yielding, and the ripening is brought about by aerobic ferments.

Gorgonzola is made of 2 curds from rather poor milk. No pressure is applied, and it ripens in about 8 weeks. The interior of this cheese grows a green mould—*penicillium glaucum*—and it is skewered to forward its growth. It is cured in a draughty cellar. The best cheeses grow a peculiar red fungus on the outside, and to imitate this many Gorgonzolas are coloured with brick dust and flour.

CREAM AND MILK CHEESE.

Gervais.—This is made from a mixture of two-thirds milk and one-third cream. Three quarts of the mixture makes one dozen cheeses. This is set at a low temperature, and the coagulation takes 48 hours. It requires about 3 days to make, and is sold when quite fresh. The cheeses are generally sold retail at 3d. each.

CREAM CHEESE.

A good cream cheese is made from the best quality of cream—8 lbs. of cream will make 6 lbs. of cheese. Each cheese weighs about 4 ozs., and is generally sold at 6d.

Any of these cheeses sell readily, especially at seaside resorts, and in large towns, and they could easily be made at any farmhouse.

In addition to the foregoing instruction, a conference was held each Wednesday evening during the course, when the class was addressed by one of the following dairy experts, viz., Mr. H. A. Howman (Warwickshire), Mr. Thomas Rigby (Cheshire), and Mr. George Gibbons (Somersetshire). A discussion followed the delivery of each address, in which the members of the class took part.

Those who conducted the teaching have given a very favourable account of the way in which the members of the class made use of the instruction afforded them. They all showed great eagerness to learn, and there is no doubt that many have profited much, not only from what they actually learnt but from what they saw there was to learn. Benefit was especially derived from the chemical laboratory work. By that means the class were able to work out points for themselves, and to grasp the first principles of the subject with far greater reality than they would have done by means of lectures alone. Having, too, been once shown how to experiment themselves by means of the simplest and most inexpensive apparatus, they will have little difficulty in carrying on the work at home or of performing simple demonstrations for the benefit of their pupils. Their teaching will thus tend to become, as regards the theory of the subject, more really a part of themselves, and not the mere recapitulation of so-called facts gathered from text-books, and of which they have had no previous opportunity of checking the accuracy.

There can, however, be no two opinions that the course was far too short, and might most advantageously be followed up by one spread over a more lengthened period. A short course has advantages in the way in which interest can be aroused in the subject, and if this class of work is pursued possibly three weeks or a month will always be enough to begin with, but it would seem highly desirable that the work should not be allowed to stop there, but continued by means of a course extending throughout one winter for those who have previously attended a short course.

In this manner, until such time as there may be some permanent dairy school established where real scientific, as well as practical, instruction may be given, and teachers of dairying trained, it would seem that help can best be afforded to those now engaged in teaching in order to enable them to extend their spheres of knowledge and usefulness.

IV.

Report on Special Research into the
Processes of Cheddar Cheese-making.

IV.—REPORT ON SPECIAL RESEARCH INTO THE PROCESSES OF CHEDDAR CHEESE-MAKING.

(MR. F. J. LLOYD, F.C.S., F.I.C.)

The Bath and West of England Society's Cheese School, at which the above research was again conducted, was opened last year at Compton House, Axbridge, and the observations were carried out, as far as possible, on the same lines as in 1891.

The dairy at this farm was attached to the dwelling-house; it was surrounded by farm buildings and faced south and west.

The fields on which the cows were pastured lay in low, level land, which had evidently once been marsh land.

Samples of the different soils were sent for analysis to Dr. J. A. Voelcker, who reported that they were all very similar in appearance, and of the nature of a clay loam. The analytical results also brought out the fact that the soils were strikingly alike in general composition, there being no one point which markedly distinguished any one soil from another. The soils contained a great deal of rootlets, which tended to show high results in organic (vegetable) matter and in nitrogen resulting therefrom.

Lime was also present in ample quantity in all, though there were no cases of the occurrence of the amounts found in the Frome soil (Vallis Farm) the year before.

The soils further showed richness in potash, and both in this respect and in that of the supply of phosphoric acid, all were in good fertility.

The separate estimation of chlorides did not bring out any case in which any excess of salt was shown, such as occurred with one of the Frome soils last year.

On the other hand, a good deal of iron was present in the ferrous and not merely in the ferric state, while analysis showed that sulphides (probably as pyrites) were present to a small degree.

These two last-named points led Dr. Voelcker to think that the soils were not in the best condition of cultivation possible, but that further aeration and opening of the soil would be beneficial.

THE STOCK AND YIELD OF MILK.

On April 1st there were 30 cows in milk. These were increased to 48 by May 25th, leaving 2 more to calve. Ten were heifers with their first calves. The cows were ordinary shorthorns of no precise character. No especial care appeared to have been taken to breed good milkers, and no register or record of the milk of individual cows was kept.

The cows were on the pastures day and night during the whole period. They received a little cake in the early months, and also in the autumn.

The water supply to the cattle was by means of dykes or ditches, the water in which, owing to the dry season, ran at times very low. The water appeared to be of very varying composition, at times mainly surface drainage water, which is not well adapted for cows in milk. Such water is, as a rule, deficient in lime, too soft in fact, and it is well known that, owing to the considerable amount of lime secreted by the cow in her milk, hard water is a desideratum.

The season was most unfavourable to the growth of grass, and the cows were, therefore, compelled to travel about and keep moving to get sufficient food. It is evident, then, that the conditions were such as to

prohibit either the largest quantity or the best quality of milk being obtained. Though it is difficult to compare the milk of one herd with that of another, much less at a year's interval, and to say definitely what causes the difference, if any, between them, yet the following comparison between the composition of the milk yielded at Frome in 1891, and at Axbridge in 1892, during the three months, August, September, and October, is interesting :—

	AVERAGE COMPOSITION OF MILK.						
	Water.	Solids.	Fat.	Casein.	Albumin.	Sugar.	Ash.
Vallis Farm, Frome. Aug. 1891 -	87'39	12'61	3'87	2'76	'37	4'84	'77
Compton House Farm, Ax- bridge. Aug. 1892.	87'72	12'28	3'38	2'65	'37	5'20	'63
Vallis Farm, Frome. Sept. 1891.	87'00	13'00	4'13	2'99	'41	4'69	'78
Compton House Farm, Ax- bridge. Sept. 1892.	87'44	12'56	3'57	2'87	'41	5'05	'66
Vallis Farm, Frome. Oct. 1891 -	86'19	13'81	4'75	3'21	'47	4'61	'77
Compton House Farm, Ax- bridge. Oct. 1892.	86'87	13'13	4'00	3'03	'51	4'84	'70

As it seemed probable that the difference first observed in August was due mainly to season, the occupier of Vallis Farm was asked to send samples of the mixed milk he was then obtaining, taken from his cheese tub at the same time as the samples were being taken at Axbridge. This he did in September, and again in October, and the results of the analyses of these samples are given in the following table side by side with the results obtained on the same days in 1891 at Vallis, and in 1892 at Axbridge :—

COMPOSITION OF MILK AT VALLIS AND AXBRIDGE COMPARED.

Date.	VALLIS, 1891.			VALLIS, 1892.			AXBRIDGE, 1892.		
	Fat.	Casein, &c.	Solids.	Fat.	Casein, &c.	Solids.	Fat.	Casein, &c.	Solids.
Sept. 12 - -	4'03	8'75	12'78	3'66	8'09	12'35	3'65	8'99	12'64
" 13 - -	4'07	8'73	12'80	4'02	8'70	12'72	3'55	8'97	12'52
" 14 - -	3'85	8'75	12'60	3'88	8'66	12'44	3'69	8'93	12'62
" 15 - -	3'98	9'06	12'84	3'96	8'76	12'72	3'57	8'87	12'44
" 16 - -	3'75	9'13	12'88	3'84	8'66	12'50	3'65	8'97	12'62
" 19 - -	4'06	9'00	13'06	3'85	8'71	12'56	3'45	9'07	12'52
Average - -	3'96	8'90	12'83	3'87	8'68	12'55	3'59	8'97	12'56
Oct. 20 - -	4'84	9'10	13'94	4'16	9'02	13'18	3'88	9'16	13'04
" 21 - -	4'98	9'08	14'16	4'24	9'04	13'28	4'08	9'20	13'28
" 24 - -	5'07	9'07	14'14	4'05	9'05	13'19	4'08	9'20	13'28
" 25 - -	4'91	9'09	14'00	4'16	9'22	13'38	4'13	9'25	13'38
" 26 - -	5'05	9'09	14'14	4'52	9'06	13'58	4'01	9'25	13'26
" 27 - -	5'20	9'10	14'30	4'49	9'05	13'58	3'80	9'20	13'00
Average - -	5'01	9'09	14'11	4'27	9'07	13'36	3'99	9'21	13'21

It will be seen that the milk obtained at Vallis in 1892 was poorer than in 1891, but was richer than that given at Axbridge. So the poorer quality of the milk yielded at Axbridge cannot be due solely to season, but is probably characteristic of the milk yielded by such pastures.

THE RECORD OF OBSERVATIONS.

The tables drawn up in 1891 so fully covered the ground of cheese-making that they were adopted last year with only one slight addition: the volume of whey. The whey was collected in a tank which was roughly graduated to show the volume. The figures are only approximate, however, for the tank was not fixed, and, though care was taken to have it always in the same position, slight variations may have occurred.

The tables also record the temperature of the dairy each day. Greater attention should be paid to the temperature of the dairy and cheese room than is at present by many cheese-makers, for evidence seems to point to the fact that temperature plays a part in cheese-making even more important than is generally supposed, and that it is as necessary to have thermometers permanently fixed in the dairy and cheese room as it is to use one in the actual operation of cheese-making.

Tables giving the daily results of the various observations have been published in the Society's Journal for 1892-93 (Fourth Series; Vol. III.). They have, however, been summarised for the purpose of more convenient reference, and a table of the monthly averages of the results is given below.

MONTHLY AVERAGES OF RESULTS OF OBSERVATIONS.

		3	5	6	7	9	10	11	13	14	15	19	20	23		
RELATING TO EVENING'S MILK.											MORN- ING'S MILK.		of Total Volume of Milk.	Stale of Whey.	MIXED MILK, &c. Proportion of Rennet added.	
Month.	Vol. of Milk.	At Night.			In Morning.											
		Temp. of Dairy.	Temp. of Milk.	Acidity.	Temp. of Dairy.	Temp. of Milk.	Acidity.	Volume.	Acidity.							
		galls.				min.	max.			galls.		galls.				
April - - -	87	55	81	18	52	55	65	19	44	17	81	34	18	9,031		
May - - -	50	62	82	21	60	64	67	23	59	20	109	40	22	9,135		
June - - -	60	64	87	22	62	65	69	23	67	21	127	44	22	9,403		
July - - -	56	65	87	21	63	66	69	23	60	21	116	46	22	9,419		
August - - -	47	66	87	21	64	66	69	23	53	21	100	45	23	9,423		
September - - -	39	61	84	21	60	62	68	23	45	22	84	44	23	9,302		
October - - -	26	66	76	21	60	65	63	22	32	21	58	41	22	9,041		

(continued.)

Month.	25	27	31	34a	35	41-45	46	51	53	54	55	60
	Acidity of Whey before breaking.	Acidity of Whey put aside.	Acidity of Whey when drawn.	Volumes of Whey.	Acidity of Draining from Piled Curd.	Acidity of Draining from Curd before grinding.	Acidity of Curd when milled.	Weight of Curd when vatted.	Acidity of Liquid from Press.	Weight of Cheese taken to Cheese Room.	Loss in Press.	Weight of Cheese when sold.
April -	'13	'14	'17	galls. —	'22	'85	4'00	lbs. 77	1'08	lbs. 71½	lbs. 5½	lbs. 68
May -	'16	'16	'20	—	'26	'92	5'24	110½	1'18	102	8½	94
June -	'15	'16	'22	111	'32	'99	4'60	132	1'16	122	10	113
July -	'15	'16	'21	97	'29	1'00	4'66	127	1'18	115	12	108
August -	'15	'16	'21	84	'30	'89	4'47	112	1'14	102½	9½	94
September -	'15	'16	'20	69	'26	'91	4'69	99	1'07	91	8	85
October -	'14	'15	'19	47	'24	99	4'10	72	1'11	68	4	62

MONTHLY AVERAGES OF RESULTS OF ANALYSES.

Month.	COMPOSITION OF MIXED MILK.						
	Water.	Solids.	Fat.	Casein.	Albumin.	Sugar.	Ash.
April -	88'25	11'75	3'06	2'35	'43	5'23	'66
May -	87'96	12'04	3'12	2'55	'40	5'25	'72
June -	87'80	12'20	3'17	2'65	'39	5'26	'73
July -	87'80	12'20	3'21	2'66	'39	5'22	'72
August -	87'72	12'28	3'38	2'65	'37	5'20	'68
September -	87'44	12'56	3'57	2'87	'41	5'05	'66
October -	86'87	13'13	4'00	3'08	'51	4'94	'70

(continued.)

Month.	COMPOSITION OF WHEY.			COMPOSITION OF CURD.			
	Solids.	Fat.	Ash.	Water.	Solids.	Fat.	Ash.
April -	7'00	'31	'54	42'04	57'96	28'82	2'54
May -	6'95	'38	'55	42'48	57'52	29'40	2'49
June -	6'91	'35	'55	41'14	58'86	29'59	2'46
July -	6'87	'34	'55	41'82	58'18	29'17	2'34
August -	6'86	'32	'54	42'25	57'75	29'49	2'16
September -	6'78	'33	'53	42'17	57'83	29'49	2'14
October -	6'89	'34	'55	41'66	58'34	30'06	2'25

EXPLANATIONS OF THE TABLES.

Cols. 5, 6, &c. *Temperatures*.—It is necessary to point out that, before the results can be taken as a guide by others, it is essential that the accuracy of the thermometer in use be made certain of. The majority of cheap thermometers are inaccurate, frequently two or three degrees out, and it makes very considerable difference, say in the temperature for renneting, if your thermometer registers 84° , while in fact the milk may be 87° F., or 81° F.

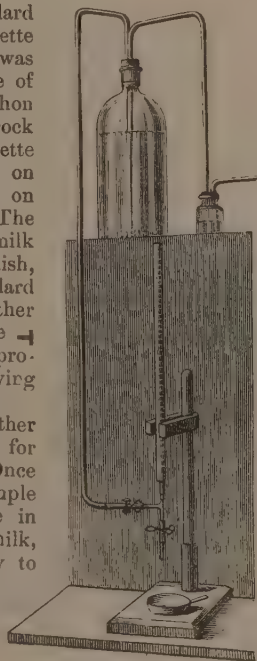
In the present observations, the temperature of the milk when rennet was added was in nearly every instance exactly 84° Fahrenheit.

Cols. 7, 11, 14, &c. *Acidity*.—These figures represent the percentages of lactic acid present. The method of conducting these determinations was as follows:—

The standard solution of caustic soda was contained in a Winchester quart bottle placed on a shelf well above the rest of the apparatus. From this, by means of a glass syphon tube, the solution was brought down automatically to the burette. As this standard solution, if exposed to the air, deteriorates by absorbing carbonic acid, it must be kept in an airtight bottle. But, unless the air could enter the bottle, none of the solution would syphon over. The air so drawn into the bottle of standard solution was, therefore, first made to pass through a small bottle of strong soda solution, coloured pink, with a few drops of the indicator Phenol phthalein. This wash-bottle absorbs all the carbonic acid from the air before it passes into the standard solution, while the moment the solution in the wash-bottle loses its power of absorbing carbonic acid, it also loses its colour. It was found to work admirably, and the strength of the standard solution remained unaltered until used up.

The syphon tube containing the standard solution was attached to the bottom of a burette by a $\neg$ joint, and the flow of the solution was stopped by a pinch-cock acting on a piece of indiarubber tubing which connected the syphon and $\neg$ joint. Upon opening this pinch-cock the standard solution flows into the burette and carries up the float. When the line on this float corresponds with the first mark on the burette, the pinch-cock is closed. The burette is now full. The sample of milk having been placed on a white porcelain dish, and 3 or 4 drops of indicator added, the standard soda solution is dropped in by opening another pinch-cock attached to the burette below the $\neg$ piece, and the quantity of soda taken to produce the pink tint is ascertained by observing how far the float has sunk.

The question has often been asked whether it would not be possible to get a test for acidity as simple as the thermometer. Once set up, the above apparatus is nearly as simple to work. All that is necessary is care in accurately measuring out the quantity of milk, &c. to be tested, and then it is as easy to read the fall of the float, as to read the rise or fall of the mercury in a thermometer.



Col. 23.—It will again be observed that the proportion of rennet used is smaller in the autumn, when the milk is rich, than in the earlier part of the year, when the milk is not of such good quality.

Cols. 31 and 32.—The time which it was necessary to keep the curd in scald was, during the months of April, May, and June, considerable, but decreased after the latter date. Considerable difficulty was experienced during those months in obtaining sufficient acidity in the whey before drawing off, and, as a deficiency at this period generally entails subsequent difficulty in obtaining cheese of sufficient ripeness, it is of much importance that the cause of this should, if possible, be discovered.

Cols. 41 to 45.—On comparing the averages in these columns, the difficulty of obtaining sufficient acidity in the early months of the year is again observed. This table, moreover, shows how close, comparatively speaking, is the average degree of acidity obtained by a careful maker throughout the season, though, when the results obtained from day to day were examined, it was seen that there were considerable fluctuations in the acidity of the whey passing from the curd when that curd is considered by the maker fit to grind.

Col. 46.—The fluctuations in the acidity of the curd when milled are very great, and it is not possible to explain their cause. Experiments have been made to discover why the curd should on some days show, for example, an acidity of 7·2 per cent., and on others only 3·6, but, up to the present, they have thrown no light on this somewhat difficult problem.

COMPARISON of AVERAGE RESULTS obtained at VALLIS in 1891 and AXBRIDGE in 1892.

Month.	VALLIS, 1891.					AXBRIDGE, 1892.				
	Vol. of Milk.	Cheese taken from Press.	Cheese when sold.	Shrinkage in ripening.	Cheese from One Gallon of Milk.	Vol. of Milk.	Cheese taken from Press.	Cheese when sold.	Shrinkage in ripening.	Cheese from One Gallon of Milk.
April -	galls. 81	lbs. 78	lbs. 69	lbs. 4	lbs. '85	galls. 79	lbs. 70	lbs. 66	lbs. 4	lbs. '835
May -	119	117	111	6	'93	109	102	94	8	'96
June -	132	132	123	9	'93	127	122	113	9	'90
July -	112	114	107	7	'96	116	115	108	7	'93
August -	91	99	91	8	1'00	100	102½	94	8½	'94
September	79	87½	82	5½	1'04	84	91	85	6	1'01
October -	52	64	59½	4½	1'14	53	68	62	6	1'07

Cols. 54 and 60.—In order to show the amount of cheese made from the milk and taken to cheese room, and the amount of ripe cheese produced, the table above has been drawn up, giving, in addition, the weight of cheese in pounds made on an average each month out of one gallon of milk. To illustrate the inferiority of the milk the results obtained at Vallis in 1891 have been inserted in this table.

When it is considered that in a fairly good season, a cheese-maker may naturally expect one pound of cheese for every gallon of milk employed, it is seen, in a striking manner, how detrimental the past season was, and how small the yield of cheese from the milk employed, while it is well known that the yield of milk itself was in all cases far below the average.

ANALYSES OF WHEY DURING TREATMENT OF CURD.

The following analyses of the whey taken during the various stages of the manufacture of the cheese, are interesting as giving some idea of the chemical changes which are taking place, and of the stages in the manufacture when fat is most likely to be lost :—

Per-centage of :—	AUGUST 5.				AUGUST 27.			
	Solids.	Fat.	Sugar, Albu- min, &c.	Ash.	Solids.	Fat.	Sugar, Albu- min, &c.	Ash.
Whey before breaking	6·87	·25	6·09	·53	6·74	·20	6·00	·54
Whey after breaking -	7·10	·44*	6·08	·58	6·98	·35	6·12	·51
Whey when drawn -	6·95	·29	6·12	·54	6·93	·27	6·13	·53
Drainings from piled curd.	6·66	·04	5·89	·73	6·65	·07	5·93	·65
Whey from curd taken to cooler.	7·73	1·13	5·58	1·02	7·67	1·07	5·64	·96
Whey after first cutting	8·22	1·30	5·56	1·36	7·78	1·12	5·51	1·15
Whey after second cutting.	8·60	1·32	5·64	1·64	7·81	·95	5·55	1·31
Whey after first turning	—	—	—	—	7·96	·94	5·55	1·47
Drainings from press -	13·90	1·03	3·89	8·98	13·46	·78	3·78	8·90

* This result is probably too high, as the curd was allowed to settle before the sample was taken, and probably a portion of the fat had risen to the surface during this time.

The above figures confirm the results which were obtained in 1891. They show how, with the development of acidity, there is a constant abstraction of the mineral matter from the curd, and that the chief loss of fat is during the first and second cutting of the curd. Hence the necessity of care being taken in performing this operation.

There are times when a far larger amount of fat than usual comes from the cheese when in the press. This fat rises to the surface of the liquid from the press in the form of an oily layer, and it is impossible to so incorporate it with the liquid as to enable a fair sample to be taken for analysis; the whole of the liquid must be analysed to obtain accurate results.

Time did not permit of this being done in conjunction with the heavy analytical work entailed by these observations, and the consideration both of the amount of fat lost on these exceptional occasions, and of the causes of the loss, must stand over for future investigation.

It seems, however, that the above results throw some light upon one or two questions of scientific and popular interest. First, it is impossible to look at the uniform proportion of sugar and albumin in these liquids, and the irregular amounts of ash, without coming to the conclusion that these bodies do not exist in the curd in a similar state.

There is no reason to suppose that the sugar and albumin, which are in solution in the milk, have been rendered insoluble by the processes of cheese-making, but there is good reason to believe that at least a portion of the lime in the milk, if no other ash constituent, is in an insoluble form combined with the casein. If this is so the above results are easily explained. The acid, as it is formed, combines with this lime and withdraws it from the casein, forming calcium lactate. Hence the difference between freshly coagulated curd and cheese might be described by saying that the one was a compound of lime and casein, the other was free casein. But this change will not be limited to the time which

elapses between the curdling of the milk and the vatting of the curd. It will also proceed during the ripening of the cheese; and may probably be the chief chemical change which takes place during ripening. This inference is supported by the observations of last year and this. Moreover, the calcium lactate so formed in the cheese would supply an admirable food for bacteria, and one which would more easily explain the formation of the chemical compounds, upon which aroma and flavour depend, than does the more complex substance casein.

There is another interesting and possible deduction. It is certain that the acid in the human stomach would be even more capable of withdrawing this lime from curd than the lactic acid produced during the manufacture and ripening of the cheese. But anything that tends to neutralise the acidity of the stomach tends to produce indigestion. May there not be, then, a good chemical explanation of the popular belief that cheese, especially new cheese, is indigestible? If this suggestion contain a truth, may it not account in some way for the diminished favour with which cheese is looked upon as a food by the working man, he being only able to obtain cheese which is almost new, and this opens up once more the economical question as to the advantages of the early ripening methods of cheese manufacture.

ANALYSES OF THE CHEESES.

The following are analyses of some of the cheeses made during the course of these observations:—

Date of Manufacture.					Water.	Fat.	Casein, &c.	Mineral Matter.
June	3	-	-	-	35.25	32.76	28.39	3.60
"	5	-	-	-	36.45	32.10	27.70	3.75
"	14	-	-	-	36.95	32.49	26.91	3.65
"	17	-	-	-	36.25	33.29	26.91	3.55
"	18	-	-	-	37.00	31.86	27.44	3.70
"	26	-	-	-	36.35	32.49	27.51	3.65
July	5	-	-	-	37.55	30.52	28.43	3.50
"	8	-	-	-	38.30	30.80	27.35	3.55
"	19	-	-	-	35.75	33.32	27.38	3.55
"	26	-	-	-	36.95	33.21	26.34	3.50
"	31	-	-	-	36.00	32.59	27.66	3.75
August	5	-	-	-	36.60	33.80	26.05	3.55
"	15	-	-	-	34.75	31.82	29.38	4.05
"	16	-	-	-	37.25	32.12	27.03	3.60
"	19	-	-	-	34.70	34.10	27.55	3.65
"	22	-	-	-	35.00	33.64	28.16	3.20
September	3	-	-	-	36.60	34.34	25.46	3.60
"	4	-	-	-	36.05	35.10	25.00	3.85
"	11	-	-	-	37.85	28.80	29.75	3.60
"	12	-	-	-	36.85	30.69	28.71	3.75
"	24	-	-	-	34.85	33.89	27.91	3.85
"	30	-	-	-	36.50	32.86	26.69	3.95
October	3	-	-	-	35.70	31.72	28.85	3.75
"	9	-	-	-	38.00	28.20	28.00	3.80
"	12	-	-	-	38.55	30.08	27.52	3.85
"	17	-	-	-	33.20	34.37	28.53	3.90
"	24	-	-	-	36.95	31.68	27.52	3.85
"	28	-	-	-	37.70	32.34	26.51	3.45
"	29	-	-	-	36.95	29.25	30.15	3.65

THE BACTERIOLOGICAL INVESTIGATION.

With the progress of this investigation, it appears more and more probable, that all the taints and peculiarities which are injurious to cheese, as also all the changes which combine to produce a good or first rate cheese are due to bacteria. It may, therefore, be well to describe the nature of the work which has been done in this direction, and point out the work which has to be done in the future, for to those unacquainted with the methods of bacteriological research it may seem strange that so much time and money should have to be spent in order to gain information which can be applied by the practical farmer.

As an illustration of this work, let one single example be taken. Most cheese-makers are acquainted with spongy and holey curd. What is the cause of this?

If a piece of such curd be broken, the little holes therein will be found to contain a minute quantity of liquid lining their sides, and giving them a shiny appearance. If a mere trace of this liquid be placed under the microscope, it is seen to contain an immense number of bacteria.

Now in order to further study these, the following work has to be done.

In the first place, it is necessary in all this work to have everything used sterilised, that is, so heated that it shall contain no bacteria, otherwise new organisms will be introduced into the material which were not really present in the curd.

Some of the liquid from one of these holes, then, having been thus taken up with a platinum rod, and diluted in a salt solution, from this diluted mixture of the liquid a drop is taken, placed, and well mixed in a test tube containing "nutrient gelatine" which has been melted at a temperature of 100 Fahrenheit. The gelatine is next poured into a sterilised glass dish, and immediately covered over.

As the liquid nutrient gelatine cools it solidifies, and each organism is now fixed in the solid gelatine. Some are capable of growing in this solid food when kept at a suitable temperature. The dish is therefore transferred to an incubator kept constantly at the temperature at which it is desired to examine the growth. In a day or two, some of the bacteria have so multiplied as to form a mass (called a colony), which is visible even to the eye, while some varieties may not make any appearance for several days. It has been nearly always found that *an impurity grows more rapidly than the Lactic Acid organism*.

As each variety of bacteria grows in a manner more or less peculiar to itself, it is possible to a certain extent, even with a pocket magnifier, but better under the microscope, to distinguish between the varieties present at this stage. Some of the colonies may be surrounded by a circle of lighter colour. They are lying in a little circle of liquid, for they have liquefied the gelatine, and it may at once be said that such liquefying organisms are rarely, if ever, present in really good curd or cheese, while they are nearly always present when there is any "taint" in the curd.

The next duty is to obtain the bacteria of each distinctive colony, and transfer them to a test tube containing "nutrient gelatine." This is done by just touching one of the colonies with a platinum wire and then drawing the wire along the surface of the new gelatine, or thrusting it into the gelatine when the organism is one which causes liquefaction. If successful in this operation, a "pure culture," that is, one containing only one variety of bacteria is obtained. These will now grow in their own peculiar way and form a characteristic growth. But it is not always possible even now to be certain of the organisms present, therefore, fresh

pure cultures are started upon new materials; those used having been mainly agar, milk, and whey.

The next duty is to examine some of the organisms from the pure culture in a little drop of water, under a high power of the microscope. Their shape can now be determined, and whether they have any characteristic way of growing, and whether they have the power of motion or not. For some move rapidly, some slowly, others not at all. Again, some are round, others little rods, and yet others long rods, while some are curved or even corkscrew shaped, and the round ones (cocci) may grow in pairs (diplococci), or in chains (streptococci), while the little rods also have a tendency to grow, sometimes singly, sometimes with two or more joined together. Thus, the lactic ferment when growing in milk is nearly always seen in pairs.

For better observation, however, these organisms are spread out on a thin piece of glass and stained. They are then permanently fixed, and become a record of the organism under investigation.

Having, for instance, obtained from this spongy curd about 5 different varieties of bacteria, the next question which arises is, which of these produces the sponginess? In order to answer this question, it is first necessary to obtain 5 flasks of liquid in which these organisms will grow, for example, sterile milk. Into each of these flasks, a pure culture of one of the varieties is placed, and the flask kept at a suitable temperature for the growth of this organism. After a few days, the milk will literally be swarming with organisms. Now, assuming that everything has been going well with the cheese for some days, one evening the flask of milk, say with variety No. 1, is poured into the evening's milk. Here, in the warm milk, the growth of the organism is rapid. The whole of the evening's milk becomes inoculated with this organism, and the next day anxious observation is made to see if the curd is spongy. If not, No. 2 variety must be proceeded with in an exactly similar manner, and so on up to No. 5 variety. In all probability, a spongy curd will be produced by one of the five. But it may not be. It may be necessary for two varieties to be present simultaneously. And then the work has to start afresh with mixtures of the pure cultures.

Even any one unacquainted with bacteriological work will thus realise that the discovery of the cause of even one "taint" is a slow process. But the object is to discover the causes of all "taints."

Yet this is only one object. Another is to discover what bacteria are present in the very best cheeses, and how far the excellence of these cheeses is due to the presence of the organisms. Here again is an immense field for research.

Hence in the work already done, very many dozens of plate cultures have been made. From these, many dozen pure cultures obtained, and many hundreds of permanent slides made. Yet there is but little progress. For, as will have become evident, before one successful experiment can be obtained, there may be, and indeed are, many unsuccessful ones.

Of the many organisms which have been found, only one can be said to be invariably present. This is the *Bacillus Acidi Lactici*, and while this organism is necessary to the production of that acidity essential to the manufacture of a good cheese, there is, moreover, good ground at present for the assumption that no other variety is necessary. Thus in the whey when an excellent curd is obtained, there will at times be no other organism present.

Moreover, the fact that it is able to grow without air as well as with air, enables it to continue its growth in the curd and cheese, and to bring about those changes to which ripeness is due.

It appears, however, by degrees to lose its power of curdling milk. Thus, if the pure organism be placed in a test tube of milk, the milk curdles in two days. If a piece of old cheese is placed in a milk tube, the milk will not curdle, perhaps, for several weeks, but if a plate culture is made from the cheese, then pure cultures from the plate, and some of the pure culture placed in a milk tube, it will rapidly curdle. The organism seems to have thus regained its power of forming lactic acid.

One of the organisms most frequently found in rennet during the various processes of cheese-making, and in the cheese itself, is much larger than any bacteria, and appears to grow by budding. It is probably a species of yeast, capable of growing upon milk sugar, and is the same organism as described by Duclaux in his recently published "*Principes de Laiterie*." It has also been described by Adametz and Kayser.

Experiments were made by inoculating milk with this organism, but no special effect was produced; the resulting cheese, however, was a very good one, and it may yet be found to play some part in the manufacture of a good cheese.

By carefully working in this way, although it has not yet been possible to discover the effect of each organism found, yet the accumulated notes render it possible by comparison to draw some highly probable conclusions.

Thus, upon stripping off the gauge from a milk pail, and examining the bacteria which were present in a little stale milk that had leaked in behind the gauge, an organism was found which has a characteristic method of growth. During the three seasons, this organism had been found on several occasions, not only at the cheese school, but in samples from dairies where they had trouble in making the cheese. Upon referring to the notes made whenever this organism had been found, it is discovered that in every instance it was accompanied by a "taint." In fact, a really good cheese never appears to have been made when this organism was found.

The results at present obtained from this method of gaining information, by continuous work and comparisons of results, point to the following conclusions.

The causes of taints are :—

First, and most frequently, dirty utensils, or utensils which, being faulty, harbour in some nook or cranny a minute portion of stale and decomposing milk or curd.

Secondly, dirty teats and unclean milkers.

Thirdly, impure water which gets upon the teats, or scouring food which also frequently causes the teats to get dirty, and results in the organisms found in the faeces being present in the milk; and

Lastly, impure air, especially where the cows are milked; for the milk in passing from the teat to the pail, washes out of the atmosphere the organisms which will ultimately prove its ruin, while even if impure air passes over the dairy, it will deposit its bacteria in the evening milk standing in the tub, and so cause a "taint."

The following are some of the results of last year's work.

The Milk.—The chief organism present in the milk, as previously indicated, was the *Bacillus Acidi Lactici*. Some slight variations in the manner of growth of this organism appears at different periods of observation; so marked, indeed, that it is doubtful whether these organisms are all the same, or whether there may not be several varieties of the bacillus. If so, it may help to explain a fact which has been very forcibly impressed during the observations, that at

times the development of acidity in the process of cheese-making is far more rapid than at others, even though the initial acidity of the milk was the same, and no cause for the variation apparent during subsequent treatment. It is only right to mention that other observers have described several bacteria having, according to their investigations, the power of forming lactic acid.

While in 1891 the freedom of the milk from other organisms was noted, in 1892 an enormous number and variety of other organisms were present. Eight of these, which were unknown as common air impurities, have been isolated and studied; all those which are common have been discarded, as there is reason to think they have no effect upon the cheese. But if the foreign bacteria were troublesome, far more so were the moulds invariably present in the milk. For the most part these moulds were common varieties, with one exception—a white mould, which did not liquefy the nutrient gelatine upon which the organisms are grown for the purpose of isolating and studying them. The white mould appeared to be the *Oidium Lactis*, about which little that was known could be found. Dr. Warming, Professor of Botany at the University of Copenhagen, in his *Handbook of Botany*, says, "it is uncertain whether it causes the souring of milk or not." At first, the fungus when grown in milk invariably curdled it, but, upon making a slide of the curdled milk, the *B. Acidi Lactici* was always present. At last a pure culture of the mould was obtained, and then it was found to have no curdling effect upon the milk. To prove that the uncurdled milk contained the mould, cultures were made from it, and a growth of the mould was invariably obtained. Although present in the milk so frequently it has not been found in a single cheese, nor can any effect be traced to its presence in the milk. As to its origin:—After many fruitless attempts to discover its source, it was at last found growing abundantly in the earthenware drain-pipe which carried the whey to a receptacle in the farmyard. Here it grew luxuriantly, doubtless contaminating the surrounding atmosphere and so entering the dairy and the milk. It only shows how careful the cheese-maker should be to seek, even at a distance, for causes of contamination which at first sight are not easily accounted for, and it proves the folly of allowing, as is often done, the pipe which carries off the whey to open into the dairy.

The Cheeses.—It has only been possible to examine comparatively few of the cheeses when fit for sale. The method has been as follows:—

(a.) A portion of the cheese is taken, and a slide made for microscopic examination.

(b.) A portion of the cheese is transferred to a sterile salt solution in a test tube, broken down into a fine paste with a little of the salt solution, and then shaken with the remainder to insure equal distribution. From this solution three minute portions are taken, with which—

1. A test tube of sterile nutrient gelatine is inoculated, and with this a plate culture is made.
2. A test tube, containing sterile milk, is inoculated with a minute portion of the liquid.
3. A second test tube, containing sterile milk, is inoculated as the first, and upon the top of the milk about one inch of melted and sterilised vaseline is carefully poured.

In No. 1, colonies are obtained of all the aerobic organisms (*i.e.*, those which require air or oxygen) still living in the cheese. No. 2 shows whether the cheese contains the *B. Acidi Lactici* or any other organism capable of curdling the milk. And in No. 3 all those organisms in the

cheese which are not capable of growing in the air, and are therefore known as anaerobic, grow, and can be studied.

As to the results obtained:—A careful examination of the slides prepared direct from the cheeses (*a*) showed that the chief organisms present, or those in greatest abundance, were a large round organism (a micrococcus), a stumpy bacillus, larger than the *B. Acidi Lactici*, though in other respects very similar, and here and there a few long thin rod bacilli. There were also some few other forms present, but only occasionally, and apparently in uncertain numbers.

Next as to the various cultures; the plates (*b*, 1) are distinguished from those prepared from the milk by this striking fact, that no organism is invariably found. Some will contain one variety of organism only, others two or three, and some several. Two varieties stand out prominently as far more frequent than any others. The one is a large stumpy bacillus, which has been found so frequently that it may be named "the cheese organism," the other is the large micrococcus seen in the cheese slides, and which for the present may be styled "the cheese micrococcus." Both of these will be preserved until the cheese-making season returns, when it may be possible to make some experimental cheeses from milk inoculated with them. In some of the plate cultures other organisms are found, but they are quite exceptional, and must be considered for the present as accidental and not essential.

In spite of the trouble caused by the presence of moulds in the milk, from which the cheeses were made, yet in the cheeses themselves it was very rare to find the least sign of mould; and, in the few instances where mould has shown itself, it may be attributed to accidental impurity, due to the great difficulty of obtaining cheese cultures without more than ordinary exposure to the air. Hence the well-known tendency of cheese to "go mouldy" must be attributed solely to its forming an admirable feeding ground for the moulds which fall upon it from the atmosphere.

A second result is this: the older the cheese the fewer the aerobic organisms found. If a taint is caused by an aerobic organism it evidently remains long after its cause has been destroyed, and is, therefore, due to the formation of a definite chemical compound. Here, then, is a new field for chemical research. But it may be that these taints are due to the action of anaerobic bacteria, and this would account for failing to discover them. Are there any well-known facts to support this supposition?

The cheese-maker finds that if there is a taint it is well to open up the curd as frequently as possible, thus allowing the air to get to it and forward the growth of acidity; and it is generally recognised that the sooner a tainted cheese is sold the better, for the taint augments with keeping. Both of these facts support the view that taints are due to organisms which do not need air for their growth and development.

The milk tubes inoculated from the cheeses (*b*, 2), contrary to expectation, did not curdle. They were carefully watched, and after several weeks showed signs of becoming thick, and finally some curdled completely, others partly. But the time which had elapsed proved that this action could not be due to the *B. Acidi Lactici*. Slides were now prepared and carefully examined microscopically, and "the cheese organism" and "cheese micrococcus" were found in abundance; but far more striking was the presence of the long thin rod bacilli. This showed that the cheese organisms, having consumed the oxygen available in the milk, had enabled the anaerobic organism to flourish. Curiously enough the acidity of these milks was found to be 0.98 per cent., of which only 0.04 per cent. was volatile. Hence these rod bacilli do not appear to be the Butyric Acid organism. Explanation

for these observations will probably be found in time, but the work is not yet far enough advanced to permit of stating those which may occur.

Lastly, there is one fact to record with regard to the results of the study of the anaerobic organisms in the tubes covered with vaseline (b, 3). The milk in these tubes invariably curdles. But in some a large volume of gas is evolved, and the plug of solid vaseline is forced up into the tube sometimes to the very top, or until an irregularity in the sides of the tube allows the gas to pass by. This formation of gas does not take place in every tube. Last year it arose only in one or two; this year it was more frequent. Now the cheeses this year were more liable to "puff" than last; hence the cause of this puffing may be attributed to an anaerobic organism which has yet to be isolated. If the study of bacteria is difficult when only aerobic organisms are concerned, it is infinitely more difficult when the anaerobic bacteria need to be examined, and it will probably require years of work to make much headway.

The cheese-maker may not unnaturally ask, what is the practical good of all this study? At present little, no doubt. But one thing seems certain, that the troubles to which cheese-makers are liable may be chiefly due to causes which do not come in at the open window or door of the dairy, but hide in out-of-the-way crannies where no breath of air even may enter, but where a little decomposing milk, or other animal or vegetable matter, may supply all the food which these organisms need to enable them to live and grow and multiply.

In addition to the observations above recorded, a number of experimental cheeses were made to test some of the questions which had arisen during the course of the observations; also, amongst other objects, to investigate the effect of various organisms upon the produce.

THE RESULTS OF OBSERVATIONS.

The Conditions essential to the Manufacture of a Cheddar Cheese of High Quality.

The results of the observations in 1891 led to the conclusion that "the fitness of the curd to settle in scald was coincident with the whey obtaining an acidity slightly greater than the acidity of the milk before renneting." The question now naturally arises, how far have the observations of 1892 confirmed those of 1891 in regard to this point? Speaking generally, they have completely confirmed them; but this statement holds good, more especially in the months of June, July, August, and September, rather than in the earlier and later months. In fact, the conditions which exist in the early months appear to be totally different to those which exist during the months June to September, and to give rise to difficulties which require special means to overcome. Nevertheless, confining these remarks solely to the method of manufacture adopted by Miss Cannon, there can be little doubt that the conditions of the curd in whey, which the practical cheese-maker judges by the touch, is really a condition brought about by a development of acidity. It is here, however, important to point out—what the experimental cheeses which were made prove—that a similar condition may be produced without the development of acidity. What the development of acidity does is to contract the curd, and thereby expel the whey. This same contraction of the curd may be produced by heat, and the whey expelled without there being a simultaneous rise in the development of acidity.

Thus the conclusion arrived at in the report of 1891 holds good solely when the other conditions are such as described in that report,

and those makers who adopt any other system cannot take the same standard of acidity as will hold good for those who adopt the Cannon system of manufacture.

ACIDITY OF CURD BEFORE GRINDING.

The second conclusion of importance to which the observations of 1891 led, was that "the acidity of the whey which drains from the curd when in the cooler is a sufficiently accurate guide to the condition of the curd before grinding." The observations of 1892 confirm this conclusion, though there are one or two points which still remain to be explained.

As to the most important question, what should this acidity be? All the evidence seems to point to the fact that the degree of acidity which may be obtained with advantage, depends upon the composition of the milk, but why this is so, it is difficult to say. Whether it be due to the proportion of fat, or to the proportion of mineral matter in the milk, future investigation can alone prove, but the thing seems certain, as stated above, that the quality of the milk affects most seriously the amount of acidity which may with advantage be obtained in the curd before grinding.

But the quality of the milk will itself depend largely on the nature of the soil and pasture, and so we begin to see into the probable cause of the difficulty, which has always been found on strong land, in making a good cheese. For strong land has a tendency to produce larger quantities of milk, but milk of poorer quality both as regards fat and mineral matter, than lighter and more lime-containing soils. What, then, is the remedy? The observations and experiments of 1892, seem to point to its being found in keeping down the acidity in the curd before vatting, in keeping the cheeses in the ripening room for a longer period than would be necessary with cheese from better land, and in taking care to maintain the temperature of the cheese room at a uniform and higher temperature than would be necessary with the richer cheese.

LOSS OF FAT IN CHEESE-MAKING.

One of the questions to which an answer was sought, was: To what extent is the fat originally present in the milk lost during the manufacture of a cheese, and what proportion of that loss falls upon each operation?

The following table, though it does not entirely answer the question, gives some interesting facts:—

Fat present in—	Weight of Fat in Pounds.	
	August 5.	August 27.
Milk - - -	39·66	33·11
Curd - - -	37·07	30·60
Whey - - -	2·79	2·14
Drainings from cooler -	·12	·15
Total found -	39·98	32·89
Errors of analysis -	·32	·22
Fat in liquid from press	·11	·06

The errors in the examples here given, taken from several sets of analyses made to determine this question, are slight. As, however, lactic acid is usually estimated with and reckoned as fat, unless special precautions are taken to correct this, there appears to be more fat in the curd, &c. than was actually present in the milk. To this fact may probably be due the notion which was, and is, in some cases, even now held, that in the ripening of cheese fat is formed.

SUMMARY OF CONCLUSIONS.

The following are the conclusions which the observations of 1891 and 1892 appear to justify.

1. The quality of milk varies on the same farm each year, owing to the season, and on the same fields each month, owing to the food. It varies on two farms during the same year, and on each has a characteristic composition due to the nature of the soil.

2. The quality of a cheese, assuming that the manufacture was conducted by a skilled maker, depends largely on the quality of the milk from which the cheese was made.

3. The manufacture of a cheese must also vary in accordance with the varying quality of the milk. Not only is this true as regards the quantity of rennet to be used, but it influences the degree of acidity which may with advantage be obtained in the curd before vatting.

4. On good soils and with rich milk a high acidity in the curd is desirable; but on heavy land yielding poor milk a low acidity is desirable.

5. A cheese made with low acidity requires longer to ripen, and probably a higher temperature than a cheese with high acidity.

6. In the spring the temperature of the dairy should be maintained artificially at from 61° to 66° Fahr.

7. In order that the curd may be put away in good time, it is essential to obtain sufficient acid in the whey before drawing it off.

8. The acidity of the mixed milk, &c. before renneting should, if possible, be .21 per cent., and of the whey in the tub before drawing, .20 per cent., so as to insure in the whey when drawn an acidity of .22 per cent.

V.

Suggested Syllabus of Subjects of Agricultural Instruction at Collegiate Centres.

V.—SUGGESTIONS FOR A GENERAL SYLLABUS OF SUBJECTS OF AGRICULTURAL INSTRUCTION AT COLLEGIATE CENTRES.

With the object of systematising the instruction given at Collegiate Centres where Agricultural Education is carried on, it has been suggested, after conference with those responsible for the teaching arrangements, that eventually provision should exist for giving instruction in the following subjects :—

- Agriculture.
- Chemistry.
- Mathematics.
- Physics and Mechanics.
- Farm Engineering and Steam Engine.
- Land Surveying and Mensuration.
- Geology.
- Biology.
 - (a.) Zoology.
 - (b.) Botany.
- Economic Entomology.
- Veterinary Hygiene.
- Book-keeping.
- *Estate management.
- *Forestry.
- *Law.

The following is a short syllabus of the different subjects comprised in the foregoing list :—

I. AGRICULTURE, INCLUDING DAIRYING.

The soil. The agricultural characters of the chief classes of soil, their adaptability to various systems of cropping, and the growth of the various crops. The indications of good and bad soil.

The amelioration and improvement of land by draining, irrigation, clay burning, paring and burning, mixing, top dressing, marling, claying, sanding, warping, liming, bare fallowing. The influence of cultivation and the growth of plants on soil.

The local climate as influenced by latitude, altitude, gradient, exposure, woods, mountains, proximity to water, &c., causes predisposing to frost during the season of growth. The influence of air-humidity and other atmospheric conditions on the growth of crops.

Tillages. The work of the various implements and machines. The comparative merits of steam, horse, and hand cultivation.

Manuring in relation to soil and crop. Sewage farming. The treatment and application of the important manures and manurial substances. Green manuring. Field trials.

Seed. Changing seed. Methods of improving existing varieties of crops, and of producing new ones. Broad-cast sowing *v.* drilling. Thick *v.* thin seeding. Deep *v.* shallow covering.

Rotations. The objects of rotations and considerations affecting their selection or modification. The principal rotations and their adaptability to varying conditions.

* Not necessary, except for certain classes of students.

150 V.—SYLLABUS OF SUBJECTS OF AGRICULTURAL INSTRUCTION.

The Main Systems of Farming, *e.g.* Stock breeding on arable and pastoral farms; tillage farming where everything is sold; suburban farming, &c.

The Farm Crops considered in relation to genera, species, varieties, climate, soil, place in rotation, tillage, manuring, sowing, treatment during growth, harvesting and storing, and disposal.

Pastures and Meadows. The plants that form the herbage of pastures, hayfields, and meadows. Weeds and poisonous plants. Seed mixtures for short leys, permanent pasture, hay, and meadows. Laying down land to grass, and its subsequent treatment. Effects of the various manures upon the botanical composition of the herbage of grass land. Haymaking. Ensilage.

Farm Live Stock. The principles of breeding. The characteristics of the various breeds of cattle, sheep, horses, pigs, and poultry. The rearing of young stock. The feeding of the various farm animals. Live weight and dead weight. The suitability of byres, boxes, sheds, and yards to different conditions of stock-feeding and breeding.

Dairying. The influence of breed and food in the yield of milk. The breed and rearing of young stock for dairy purposes. The manufacture of butter and cheese.

Farm servants. The different systems of housing and paying them. Contract labour and day labour. Payment in kind and in money. Engagements.

II. CHEMISTRY.

(a.) Inorganic.

Principles of chemistry. Laws of chemical combination. Study of the non-metallic elements and their simple compounds. Acids, bases, salts. The manufacture of sulphuric, hydrochloric, and nitric acids. General properties of the metals and their compounds. Extraction of the ordinary metals from their ores.

(b.) Organic.

Methods of proximate and ultimate analysis of organic compounds. The paraffins, methane and ethane, and their more important derivatives. Alcohol, its manufacture. Fermentation. Ether. Acetic acid. Oxalic, lactic, malic, tartaric and citric acids. Glycerine, fats, and oils. Cyanogen, hydrocyanic acid, amines, amides, urea, uric acid. Carbohydrates, sugars, starch, cellulose, and gum. Vegetable alkaloids, glucosides.

(c.) Agricultural.

The origin and formation of soils. The constituents and properties of soil. Plants in relation to mineral and other food. Nitrification. Manures; their origin, properties, value, adulterants, impurities, &c. The valuation of manures. Fodders and foods, their constituents, value, uses, impurities, &c. Diets for the production of work, fat, bone, milk, &c. Nutritive ratios. The chemistry of the dairy.

(d.) Practical Chemistry Course.

Fitting and manipulation of simple chemical apparatus. Preparation and examination of the properties of some of the more important gases, such as oxygen, hydrogen, chlorine, ammonia, hydrochloric acid, nitric oxide. Simple and complex qualitative analysis. Estimation by gravimetric and volumetric methods of the more important basic and

V.—SYLLABUS OF SUBJECTS OF AGRICULTURAL INSTRUCTION. 151

acid radicles; including iron, lime, magnesium, potassium, sodium, chlorine, sulphuric acid, phosphoric acid.

Analysis of commercial samples of sodium nitrate, ammonium sulphate, and kainit. Estimation of phosphoric acid in the various forms of phosphatic manures. Analysis of milk. Estimation of oil in oil-cakes.

III. MATHEMATICS.

Euclid, Books 1-3. **Algebra** to include simple equations and the use of logarithms. **Trigonometry** as far as the solution of plane triangles.

IV. PHYSICS AND MECHANICS.

Experimental mechanics. Velocity, force, laws of motion, work, energy, friction. Simple machines, viz., lever, balance, wheel and axle, pulley, inclined plane.

Elementary hydromechanics, and pneumatics.

Elements of heat, including elementary theory and use of the steam-engine.

V. FARM ENGINEERING.

The farm steam engine and its economic management. **Horse and water mills.** **The turbine.** **The principles of the construction of the important machines used on a farm.**

VI. LAND SURVEYING.

The instruments. **Levelling**, measurement of plane figures. **Elementary surveying and plotting.** **The measurement and calculation of the contents of cuttings, embankments, &c.**

VII. GEOLOGY.

The chief geological agents. **The position and characters of the important formations and igneous rocks in Britain.** **The weathering agents, and the formation of soil.** **The glacial period.**

VIII. BIOLOGY.

(a.) Zoology.

The fundamental facts illustrating the morphology and physiology of the following types:—

A mammal (rabbit); a bird; a frog; a snail, or freshwater mussel; an insect, or crayfish; an earthworm.

The general features of the vertebrate skeleton, as illustrated by the above types. **The structure and functions of the various organs**, omitting purely physiological and histological details.

To this may be added:—

Mammalian dentition. **The classification and general structure of the chief domestic animals** (horse, ox, sheep, pig, fowl). **The classification, structure, and life-history of the principal animal parasites** (tapeworms, round-worms, flukes, ticks).

(b) Botany.

The fundamental facts illustrating the morphology, physiology, histology, and life-history of the following:—

The flowering plant; a gymnosperm (*Pinus*); a fern; an alga (*Spyrogyra* or *Fucus*); a fungus (*Mucor* and *Saccharomyces*); a bacterium.

152 V.—SYLLABUS OF SUBJECTS OF AGRICULTURAL INSTRUCTION.

The structure and functions of root, stem, and leaf.

Determination of the orders of flowering plants. Means of identifying the most important farm crops, the chief meadow and pasture grasses, and weeds.

Plant diseases caused by vegetable parasites.

IX. ECONOMIC ENTOMOLOGY.

The general structure of arthropods. The structure and life-history of selected insect types. Metamorphosis. The characters of the orders of insects. Practical study of mouth-parts, and other organs used in classification. Characteristic larvæ and pupæ of the chief orders.

The commoner insects of economic importance, whether useful or injurious. Appearance of the crops when attacked. Principal measures of prevention and remedy. The natural checks to undue increase (birds and other devourers, ichneumons, &c.).

X. VETERINARY HYGIENE.

The causes and prevention of disease. Hygienic conditions in stables, byres, &c. The more important ailments, diseases, and blemishes due to food, work, shoeing, heredity, infection, contagion, environment, accident, parturition, lactation, &c. The course to be taken in the case of an accident or sudden outbreak of disease. The elements of materia medica.

XI. BOOK-KEEPING.

Single and double entry. Journal, cash-book, and ledger. Farm book-keeping. Valuation of stock and effects.

XII. ESTATE MANAGEMENT.

Leases. Tenants compensation for improvements and manner of assessment. Valuations. Estate improvement by planting trees and hedges, draining, reclaiming waste or poor land, embanking, irrigation, supplying water, fencing, road-making, building, &c. Designing and construction of farm buildings. The properties, quality, source of supply, price, &c. of such materials as stones, bricks, slates, mortar, cement, timber, &c.

XIII. FORESTRY.

The tissues of trees. Lignification. Growth in height and in thickness. The identification of trees in summer and in winter by means of buds, shoots, leaves, bark, &c. The properties and identification of timbers; methods of increasing the durability of timber. The examination of the important forest trees from a botanical and sylvicultural point of view. Suitability of trees to local conditions. Artificial and natural formation of woods. The insects and diseases that attack trees, noting methods of prevention and cure. The utilization of forest produce.

XIV. LAW.

The law as regards leases, renunciation of tenancy, dilapidations, sales, warranty, engagements, rights in timber, game, heather burning, &c. Economic aspect of farm contracts.

EXPERIMENTS ON LIVING ANIMALS.

RETURN to an Address of the Honourable The House of Commons,
dated 1 *May* 1893 ;—for,

“ RETURN showing the Number of EXPERIMENTS performed on LIVING ANIMALS during the Year 1892, under LICENSES granted under the Act 39 & 40 Vict. c. 77, distinguishing Painless from Painful Experiments (in continuation of Parliamentary Paper, No. 218, of Session 1892).”

Home Office, }
4 May 1893. }

HERBERT J. GLADSTONE.

(*Mr. Herbert Gladstone.*)

Ordered, by The House of Commons, to be Printed,
4 May 1893.

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RETURN showing the Number of EXPERIMENTS performed on LIVING ANIMALS during the Year 1892. under LICENSES granted under the Act 39 & 40 Vict. c. 77, distinguishing Painless from Painful Experiments (in continuation of Parliamentary Paper, No. 218, of Session 1892).

ENGLAND AND SCOTLAND.

Sir,

I HAVE the honour to submit the following Report on Experiments performed in England and Scotland during the Year 1892, under the Act 39 & 40 Vict. c. 77, including,—

- I. The Names of all Persons who have held Licenses or Special Certificates during any part of the Year; together with a Statement of the Registered Places, at which the Licenses were valid, and the Names of Persons qualified under the Act to sign applications for Licenses, and to grant Special Certificates.
- II. The Total Number of Experiments performed during 1892, classified and arranged according to their general Nature.

R E P O R T.

THE names of all those persons who held licenses during 1892 will be found in Tables I. and II. The total number of licensees was 180, of whom 55 performed no experiments.

In 1892 there were 59 “licensed places,” in 37 different institutions, in England and Scotland. Four “licensed places” were added, and five “licensed places” were removed from the register, in the course of the year.

The names of all those “licensed places” to which licensees were accredited are given in the tables. All licensees were restricted to the licensed place or places specified on their licenses, with the exception of those who were permitted to perform inoculation experiments in places other than a “licensed place,” with the object of studying outbreaks of disease among animals in remote districts.

Tables I. and II. afford evidence,—

1. That licenses and certificates have been granted and allowed only upon the recommendation of persons of high scientific standing.
2. That the licensees are persons who, by their training and education, are fitted to undertake experimental work and to profit by it.
3. That all experimental work has been conducted in suitable places.

Table III. shows the number and the nature of the experiments performed by each licensee mentioned in Table I., specifying whether these experiments were done under the license alone or under any special certificate, so that the reader may judge which experiments (if any) were of a painful nature.

From

From this table it appears that the total number of experiments performed in 1892 was 3,960.

Of these, there were performed,—

Under license alone	-	-	-	-	-	-	1,046
„ Certificate A.	-	-	-	-	-	-	2,239
„ Certificate B.	-	-	-	-	-	-	303
„ Certificate C.	-	-	-	-	-	-	125
„ Certificate D. + A. (included under A.)	-	-	-	-	-	-	—
„ Certificate E. + A. or B.	-	-	-	-	-	-	229
„ Certificate F. + A. or B.	-	-	-	-	-	-	18
Total	-	-	-	-	-	-	3,960

In experiments conducted under the license alone, or under Certificate C., of which the combined total for the year is 1,171, the animal suffers no pain, because complete anæsthesia is maintained from before the commencement of the experiment until the animal is killed.

In experiments conducted under Certificate A. (or E. or F. linked with A.), of which the combined total for the year is 2,273, the pain of the operation (which is practically always of the nature of hypodermic injection or simple inoculation) is trivial; and it is always made a condition of this certificate that the animal shall be killed if pain result.

In experiments performed under Certificate B. (or E. or F. linked with B.), of which the combined total for the year is 516, the animal is anæsthetised during the operation, but is allowed to recover. These operations, in order to ensure success, are necessarily done with as much care as are similar operations upon the human subject, and the wounds being dressed antiseptically no pain results during the healing process.

Certificates E. or F., when allowed, are invariably linked with A. or B. What has been said with regard to A. and B. applies therefore to E. and F.

As regards the nature of the experiments, 1,069 were physiological, 2,290 were pathological, and 601 were therapeutical or pharmacological.

Certificate E. authorises experiments to be made upon cats and dogs “without anæsthetics,” and this hitherto has been the only form of certificate authorising experiments on these animals.

Inasmuch as no experiment (other than inoculation or some equally simple procedure) is ever permitted to be performed without anæsthetics, the terms of Certificate E. have often proved misleading. The Secretary of State has, therefore, permitted the introduction of a new certificate (to be designated E E.), which in the future will always be submitted when a cat or dog is the subject of the experiment, and when it is proposed to administer an anæsthetic for the initial operation, and to allow the animal to survive. This new certificate (which will always be linked with B.) came into force at the beginning of the current year (1893).

During the year 1892, 122 visits of inspection to the various licensed places were made by Dr. Russell and myself, which have been severally reported.

I am, Sir,

Your obedient Servant,

G. V. Poore,
Inspector.

8 March 1893.

The Right Honourable the Secretary of State
for the Home Department.

ENGLAND AND SCOTLAND.

TABLE I.

LIST of LICENSEES who performed EXPERIMENTS under their LICENSES and CERTIFICATES in 1892.

NAMES OF REGISTERED PLACES.		NAMES OF LICENSEES.		Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
				Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
				A.	B.	C.	D.			
ABERDEEN:										President of the Royal College of Surgeons, England; Professor of Physiology, University College, London; President of the Faculty of Physicians and Surgeons, Glasgow; President of the Royal College of Surgeons, Edinburgh; Professor of Materia Medica, University of Aberdeen. President of the Royal College of Physicians; Professor of Physiology in University College, London; President of the Royal Society; Professor of Physiology in the University of Oxford; President of Royal College of Surgeons, Ireland; Professor of the Institute of Medicine in University of Aberdeen; President of the General Medical Council; Professor of Physiology in University of Aberdeen. President of the Royal College of Surgeons, Edinburgh; Professor of Physiology, University of Aberdeen.
1	University, Physiological Department	John A. McWilliam, M.D.	-	-	1	1	-	-	-	
1	University, Pathological Laboratory, Materia Medica Laboratory, Bacteriological Laboratory and Animal Room, Mariachal College, Aberdeen.	John Theodore Cosh, M.D., F.R.S.	-	2	-	1	-	1	-	
1	University Pathological Laboratory	George Dean, M.B.	-	1	-	-	-	-	-	
CAMBRIDGE:										President of the Royal College of Physicians; Professor of Physiology in the University of Cambridge. President of the Royal Society; President of the Faculty of Physicians and Surgeons of Glasgow; Professor of Anatomy, University of Cambridge.
1	University, Physiological Laboratory, New Museum.	H. K. Anderson, M.A., M.B., B.C.	-	-	1	-	-	-	-	
1	- - - Ditto	Lewis Esle Shore, M.B.	-	-	-	1	-	-	-	

1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	President, Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge; Professor of Physiology, University College, London.
1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	President, Royal College of Physicians; Professor of Physiology, University of Cambridge.
DUNDEE:																		
1	The portion of the Physiological Department in the Chemical Laboratory Buildings of the University College, Dundee.	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	Professor of Physiology, University of Cambridge.

* Dr Roy can also perform experiments at the registered places of the Brown Institution, Wandsworth-Road, and the Physiological Laboratory, University College, London; and at such place or places as may be advisable for the effectual attainment of the object of such experiments. After 22nd December, Dr. Roy's license was made available for the Pathological Laboratory, University of Cambridge, and at such place or places as may be advisable for the effectual attainment of the object of such experiments.

† This license is no longer in force.

§ After the 15th October, Mr. Kanthack could only perform experiments at the Physiological Laboratories of the Medical School, University College, Liverpool.

† This certificate is no longer in force.

ENGLAND AND SCOTLAND—continued.

TABLE I. — List of Licensees who performed Experiments under their Licenses and Certificates in 1893—continued.

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
			A.	B.	C.	D.			
EDINBURGH:									
1	University, Physiological Department	William Rutherford, M.D., F.R.S.	-	-	1	1	-	-	President of the Royal College of Surgeons, Edinburgh; President of the Royal College of Physicians, Edinburgh.
1	- - Ditto	John Berry Haycraft, M.B., B.Sc. ²	-	-	1†	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of the Institutes of Medicine, University of Edinburgh; President of the Royal College of Physicians, Edinburgh; Professor of Physiology, University of Edinburgh.
1	- - Ditto	Arthur J. Whiting, M.B.,†	-	1†	-	-	1†	-	President of the Royal College of Physicians, Edinburgh; Professor of Physiology, University of Edinburgh.
1	- - Ditto	Edmund W. Carlier, M.D.	-	2	2§	-	-	-	President of the Royal College of Physicians, Edinburgh; Professor of Physiology, University of Edinburgh.
1	University, the Laboratory of the Surgical Department.	D. W. Johnston	1	-	-	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Surgery, University of Edinburgh.
1	University, Materia Medica Department	Joseph Tillie, M.D.	3§	-	-	-	-	-	President, Royal College of Physicians, Edinburgh; Professor of Medical Jurisprudence, University of Edinburgh; Professor of Practice of Physic, University of Edinburgh; Professor of Materia Medica and Therapeutics, University of Edinburgh; President of the Royal Society, Edinburgh.

1	- - - Ditto - - - ditto	- - -	1	- - -	- - -	- - -	- - -	- - -	President of the Royal Society of Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	The Rooms and Outhouses of the Laboratory of the Royal College of Physicians, 7, Lauriston-lane, Edinburgh.	William C. Sillar, M.B., B.Sc.	1	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Surgeons, Edinburgh; Professor of Anatomy, University of Edinburgh.
1	- - - Ditto - - - ditto	Henry A. Thomson, M.B., B.S., F.R.C.S.	1	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - - Ditto - - - ditto	James C. Dunlop, M.B. †	-	- - -	- - -	- - -	- - -	1	President of the Royal College of Physicians, Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - - Ditto - - - ditto	Ralph Stockman, M.D.	1	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; Professor of Anatomy, University of Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - - Ditto - - - ditto	Gerald Fitzgerald, M.B., C.M.	1	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - - Ditto - - - ditto	William Landie, M.B., C.M.	-	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; Professor of the Practice of Physic, University of Edinburgh.
1	- - - Ditto - - - ditto	Thomas D. Poole, M.B. ‡	1 †	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; Professor of the Practice of Physic, University of Edinburgh.
1	- - - Ditto - - - ditto	R. W. Philip, M.B.	1	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; President of the Royal College of Surgeons, Edinburgh; Professor of Practice of Physic, University of Edinburgh.
1	- - - Ditto - - - ditto	Alexander C. Houston, M.B., C.M., B.Sc. ‡	1 †	- - -	- - -	- - -	- - -	- - -	President, Royal College of Surgeons, Edinburgh; Professor of Medical Jurisprudence, University of Edinburgh.
1	- - - Ditto - - - ditto	Francis D. Boyd, M.B., M.R.C.P.E.	-	- - -	- - -	- - -	- - -	- - -	President of the Royal College of Physicians, Edinburgh; Professor of the Practice of Physic, University of Edinburgh.

* After 7th November 1892 Mr. Hayercraft could only perform experiments at the new Physiological Theatre and the Rooms comprised in the Physiological Laboratory, together with the Curator's Room, University College, London.

† This certificate is no longer in force.

‡ This license is no longer in force.

§ One of these certificates is no longer in force.

|| After 5th November 1892 Mr. Fitzgerald could only perform experiments at the Rooms and Outhouses of the Laboratory of the Royal Colleges of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.

ENGLAND AND SCOTLAND—continued.

TABLE I.—List of Licensees who performed Experiments under their Licenses and Certificates in 1892—continued.

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics.	Permitting Experiments on Horses, Mules, or Asses.	
			A.	B.	C.	D.	E. (always coupled with A. or B.)	F.	
1	EDINBURGH—continued. Park-place Medical School, Park-place -	Robert M. Murray, M.B., C.M.*	-	1 †	-	-	-	-	President of the Royal College of Physicians, Edinburgh; President of the Royal College of Surgeons, Edinburgh; Professor of Clinical Surgery, University of Edinburgh; Professor of Surgery, University of Edinburgh.
1	The Laboratory and Physiological Class Room of the Veterinary College, Edinburgh.	John McFadyen, M.B., B.Sc. † -	4 §	-	-	-	-	2	President of the Royal College of Surgeons, Edinburgh; Professor of Anatomy, University of Edinburgh; Professor of Surgery, University of Edinburgh; Professor of Medicine, University of Edinburgh.
1	GLASGOW: The Laboratory attached to the Materia Medica Retiring Room, University of Glasgow.	Matthew Charteris, M.D.	1	1	-	-	-	-	President of the Royal College of Physicians, Edinburgh; President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Anatomy, University of Glasgow.
1	- - Ditto - - ditto	William MacLennan, M.B., C.M.	1	1	-	-	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Materia Medica, University of Glasgow; Professor of Anatomy, University of Glasgow.
1	University, Physiological Laboratory, and Physiological Class Room.	Andrew N. MacGregor, M.D.	-	1	-	-	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Physiology, University of Glasgow.
1	- - Ditto - - ditto	W. E. F. Thomson, M.B. -	1	-	-	-	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Physiology, University of Glasgow.

1	Veterinary College, 83 and 85, Buccleuch-street.	Robert Kirk, M.D., C.M.	-	-	-	-	-	-	-	1	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Clinical Surgery, University of Glasgow; Professor of Materia Medica, University of Glasgow; President of the Royal College of Physicians.
1	The Medical Department of St. Mungo's College, Glasgow.	Charles Workman, M.D.	-	-	-	-	-	-	-	-	-	-	President of the Faculty of Physicians and Surgeons of Glasgow; Professor of Materia Medica in the University of Glasgow.
1	- - Ditto - - ditto	John L. Steven, M.D.	-	-	-	-	-	-	-	-	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Materia Medica, University of Glasgow.
1	The Physiological Laboratories of the Medical School of University College, Liverpool.	Randle Leigh, M.B., B.Sc., M.R.C.S.†	-	-	-	1†	1†	-	-	1†	-	-	President of the Royal College of Surgeons, England; Professor of Physiology, University College, Liverpool (Victoria University).
1	- - Ditto - - ditto	Frank Thomas Paul, F.R.C.S.	-	-	-	-	-	-	-	1	-	-	President of the General Medical Council; President of Royal College of Surgeons, England; Professor of Physiology, University College, Liverpool (Victoria University).
1	- - Ditto - - ditto	H. Leslie Roberts, M.B.	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Surgeons, England; Professor of Physiology, University College, Liverpool (Victoria University).
1	- - Ditto - - ditto	Francis Gotch, M.R.C.S.	-	-	-	-	1	-	-	-	-	-	President of the Royal Society; Professor of Physiology in the University of Oxford; President of the Royal College of Surgeons, England.
1	University College, London; the new Physiological Theatre and the Rooms comprised in the Physiological Laboratory, together with the Curator's Room.	E. A. Schäfer, M.D., F.R.S.	-	-	-	-	1	-	-	-	-	-	President of the Royal Society; Professor of Physiology in University College, London; Professor of Physiology in the University of Cambridge.
1	- - Ditto - - ditto	W. H. Thompson, M.D.	-	-	-	-	-	-	-	1	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.
1	- - Ditto - - ditto	J. H. Parsons, B.Sc., M.R.C.S.	-	-	-	-	-	-	-	2	-	1	President of the Royal College of Physicians; Professor of Physiology, University College, London.

* After 9th November 1892 Mr. Murray could also perform experiments at the Rooms and Outhouses of the Laboratory of the Royal College of Physicians, 7, Lauriston-lane, Edinburgh.

† This certificate is no longer in force.

‡ After 24th November 1892 Mr. McFadyen could only perform experiments at the Sheda and Loose Boxes occupying the North-East part of the buildings, together with the Demonstrator's Room adjoining the Dissecting Room of the Royal Veterinary College, Camden Town, and such other place or places in the United Kingdom as should be approved by the Inspector.

§ Two of these certificates are no longer in force. || One of these certificates is no longer in force. ¶ This license is no longer in force.

ENGLAND AND SCOTLAND—*continued*.TABLE I.—List of Licensees who performed Experiments under their Licenses and Certificates in 1892—*continued*.

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
			A.	B.	C.	D.	A. or B.)	F.	
1	LONDON— <i>continued</i> . University College, London; the new Physiological Theatre and the Rooms comprised in the Physiological Labo- ratory, together with the Curator's Room.	F. H. Edgeworth, M.B., B.A.	-	1	-	-	1	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	- - - Ditto - - - ditto - - -	H. W. M. Tims, M.D.	-	1	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University Col- lege, London.
1	- - - Ditto - - - ditto; also the Rooms of the Pathological Department.	Henry Percy Dean, M.Sc., M.R.C.S.	-	1	-	-	1	-	President of the General Medical Council; Professor of Surgery in University College, London; President, Royal College of Surgeons, England; Professor of Physi- ology, University College, London.
1	The Physiological Laboratory, University College, London.	J. R. Bradford, M.D., D.Sc.	-	2	-	-	1	-	President of the Royal College of Physicians; President of the Royal College of Sur- geons, England; Jodrell Professor of Physiology, University College, London.
1	- - - Ditto - - - ditto - - -	William M. Bayliss, B.A., B.Sc.	-	-	-	-	-	-	President of the Royal Society; Jodrell Professor of Physiology, University Col- lege, London.
1	- - - Ditto - - - ditto - - -	S. Martin, M.D.†	3	1†	-	-	-	-	President of the Royal Society; Professor of Physiology, University College, Lon- don; President of the Royal College of Physicians.
1	The Pathological Department, University College, London.	R. W. Boyce, M.R.C.S.	1	2	1	-	1	-	President of the General Medical Council; Professor of Surgery, University College, London; President of the Royal College of Physicians.

1	- - Ditto - - ditto	- - -	J. S. R. Russell, M.B.	- - -	- - -	2 §	- - -	2 §	- - -	President of the Royal College of Physicians; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	- - -	C. D. Cooper, M.R.C.S., &c.	- - -	- - -	1	- - -	1	- - -	President of the Royal College of Physicians; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	- - -	C. D. Marshall, F.R.C.S., L.R.C.P.	- - -	- - -	2 §	- - -	2 §	- - -	President of the Royal College of Physicians; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	- - -	A. B. Harris, B.A.	- - -	1	- - -	- - -	- - -	- - -	President, Royal College of Physicians; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	- - -	Stephen Paget, M.A., F.R.C.S.	- - -	- - -	1 †	- - -	- - -	- - -	President, Royal College of Physicians; Professor of Physiology, University College, London.
1	- - Ditto - - ditto	- - -	Max Walthard, M.D.	- - -	- - -	1 †	- - -	1 †	- - -	President of Royal College of Physicians; Professor of Surgery, University College, London.
1	King's College, Physiological Laboratory	- - -	William D. Halliburton, M.D., B.Sc., M.R.C.P.	- - -	- - -	- - -	1	- - -	- - -	President of the General Medical Council; Professor of Physiology, University College, London.
1	- - Ditto - - ditto	- - -	J. W. Pickering, B.Sc.	- - -	- - -	- - -	- - -	- - -	- - -	President, Royal College of Physicians; Professor of Physiology, King's College, London.
1	Bacteriological Laboratory, King's College, London.	- - -	Sir H. R. Beavor, Bart., M.B., M.R.C.P.	1	- - -	- - -	- - -	- - -	- - -	Professor of Clinical Surgery, King's College, London; Professor of Anatomy, King's College, London; President of the Royal College of Physicians.
1	- - Ditto - - ditto	- - -	Richard T. Hewlett, M.B. -	1	- - -	- - -	- - -	- - -	- - -	President, Royal College of Physicians; Professor of Physiology, King's College, London.
1	The Neuro-Pathological Laboratory, King's College, London.	- - -	David Ferrier, M.D., F.R.S.	- - -	- - -	2 §	- - -	- - -	- - -	President of the Royal College of Physicians; Professor of Clinical Surgery, King's College, London; Professor of Clinical Surgery, University College, London.
1	The Laboratory for Surgical Pathology, King's College, London.	- - -	G. L. Cheate, F.R.C.S.	- - -	1 †	- - -	- - -	- - -	- - -	President, Royal College of Physicians; Professor of Physiology, University College, London.

* Mr. Dean can also perform experiments at the Rooms and Out-houses of the Laboratory of the Royal Colleges of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.

† Dr. Martin can also perform experiments at the Rooms and Out-houses of the Royal College of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.; and at Greenhill, Harrow.

|| This license is no longer in force.

§ One of these certificates is no longer in force.

† This certificate is no longer in force.

ENGLAND AND SCOTLAND—*continued*.TABLE I.—List of Licensees who performed Experiments under their Licenses and Certificates in 1892—*continued*.

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics.	Permitting Experiments on Horses, Mules, or Asses.	
			A.	B.	C.	D.	E. (always coupled with A. or B.)	F.	
LONDON—<i>continued</i>.									
1	St. Bartholomew's Hospital, London; portion of building used by Medical School.	V. D. Harris, M.D.	1	-	1	-	-	-	President of the Royal College of Surgeons, England; Professor of Physiology in University College, London; President of the Royal College of Physicians; Pro- fessor of Physiology, University of Cam- bridge.
1	- - Ditto - - ditto	Edward C. Bousfield, L.R.C.P., M.R.C.S.*	1	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Oxford.
1	- - Ditto - - ditto	Charles B. Lockwood, F.R.C.S.	1	-	-	-	-	-	President of the Royal College of Surgeons; Professor of Physiology; University of Cambridge; President of the Royal Col- lege of Physicians.
1	- - Ditto - - ditto	T. J. Bokenham, M.R.C.S.†	2†	-	1	-	-	-	President of the Royal Society; Professor of Physiology, University of Cambridge; President of the Royal College of Phy- sicians; Professor of Physiology, Uni- versity College, London.
1	- - Ditto - - ditto	R. D. Batten, M.D., B.S., M.R.C.S.‡	-	2‡	-	-	3	-	President of the Royal Society; Professor of Physiology, University of Oxford; President of the Royal College of Phy- sicians; Professor of Physiology, Uni- versity College, London.
1	- - Ditto - - ditto	James Calvert, B.A.	-	-	-	-	-	-	President, Royal College of Physicians; Pro- fessor of Physiology, University College, London.

1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President, Royal College of Physicians; Professor of Physiology, University of Oxford.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President, Royal College of Physicians; Professor of Physiology, University College, London.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal Society; President, Royal College of Physicians; Professor of Physiology, University of Cambridge; Professor of Physiology, University College, London.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President, Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President, Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Medical Jurisprudence, University College, London.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the General Medical Council; Professor of Physiology, Royal Veterinary College, N.W.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Veterinary Surgeons; Professor of Physiology, University College, London.
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Surgeons, England; Professor of Physiology, University College, London.

• Mr. Bonsfield could also perform experiments at the Bacteriological Department, consisting of the Laboratories, on the top floor, and of the back-room in the basement of 101, Great Russell-street, W.C., known as the College of State Medicine, up to 25 April 1892.

College of State Medicine, up to 25 April 1892.
 † Mr. Bokenham can also perform experiments at the Rooms and Outhouses of the Laboratory of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.
 † One of these certificates is no longer in force.

† One of these certificates is no longer in force.
§ Dr. Batten can also perform experiments at the Rooms and Outhouses of the Laboratory of the Royal Colleges of Physicians and Surgeons (England and London), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.
¶ This license is no longer in force.
‡ This certificate is no longer in force.

¶ This certificate is no longer in force.

|| This license is no longer in force.

** Mr. Fletcher can also perform experiments at the Rooms and Outhouses of the Laboratory of the Royal College of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.

** Mr. Starling can also perform experiments at the Physiological Laboratory, University College, London.

†† Mr. Andrews could also perform experiments at the Brown Institution, Wandsworth-road, London.

* Mr. Macdonald can also perform experiments at the Physiological Laboratory, University College, London.

Two of these certificates are no longer in force.

ENGLAND AND SCOTLAND—continued.

TABLE I.—LIST of Licensees who performed Experiments under their Licenses and Certificates in 1892—continued.

NAMES OF REGISTERED PLACES.		NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
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			A.	B.	C.	D.	A. or B.	F.	
LONDON—continued.									
1	The Bacteriological Department, consist- ing of the Laboratories on the top floor and of the back room in the basement of 101, Great Russell-street, W.C., known as the College of State Medicine.	Allan Mac Fadyen, M.D., B.Sc.	1	-	-	-	-	-	President of the Royal College of Physicians; President of the Royal College of Sur- geons, England; Professor of Physiology, University College, London.
1	St. Thomas's Hospital; the Physiological Laboratory of the Medical School.	Samuel G. Shattuck, F.R.C.S.	1	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University Col- lege, London.
1	- Ditto - - ditto - -	A. S. F. Günbaum, B.A.	-	1	-	-	-	-	President of the Royal Society; Professor of Physiology, University of Cambridge; President of the Royal College of Phy- sicians; Professor of Physiology, Uni- versity College, London.
1	- Ditto - - ditto - -	S. A. M. Copeman, M.A., M.D.	1	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	- Ditto - - ditto - -	Everett Millais	1	-	-	-	-	1	President of the Royal College of Physicians; Professor of Physiology, in the Uni- versity of Cambridge.
1	- Ditto - - ditto - -	Charles S. Sherrington, M.A., M.B. † † †	2 †	1 §	1 §	-	-	-	President of the Royal Society; Professor of Physiology in the University of Cam- bridge; President of the Royal College of Physicians.
1	Brown Institution, Wandsworth-road, London; the Laboratory, Stables, and Post-mortem Room.	Alfred H. Tubby, F.R.C.S. †	-	-	-	-	-	-	President of the Royal College of Physicians; President of the Royal Society; Professor of Physiology, King's College, London.
1	- Ditto - - ditto - -	F. W. Mott, M.D., B.S. †	-	1	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.

1	- - Ditto - - ditto	- -	- -	- -	- -	1	1	1	President of the Royal College of Physicians ; Professor of Physiology, University Col- lege, London.
1	- - Ditto - - ditto	- -	- -	- -	2**	200	2†	-	President of the Royal College of Physicians ; Professor of Physiology, University Col- lege, London ; Professor of Clinical Sur- gery, King's College, London.
1	- - Ditto - - ditto	- -	- -	- -	-	1§	-	-	President of the General Medical Council ; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	- -	- -	1	3	2	1	-	President of the General Medical Council ; Professor of Surgery, University College, London ; President of the Royal College of Physicians ; Professor of Medicine, University College, London.
1	- - Ditto - - ditto	- -	- -	- -	300	-	-	-	President of the Royal Society ; Professor of Physiology in the University of Ox- ford ; Professor of Physiology, University of Cambridge ; President of the Royal College of Surgeons, England ; President of the Royal College of Physicians.
1	- - Ditto - - ditto	- -	- -	- -	1	400	1	-	President of the Royal College of Physicians ; President of the Royal College of Sur- geons, England ; Professor of Physiology, University of Cambridge ; Professor of Physiology, University College, London.
1	- - Ditto - - ditto	- -	- -	- -	1§	-	-	-	President of the Royal College of Physicians ; Professor of Physiology, University of Cambridge.
1	- - Ditto - - ditto	- -	- -	- -	-	1	1	-	President of the Royal College of Physicians ; Professor of Surgery, University College, London.

* Dr. Copeman can also perform experiments at the Pathological Laboratory, Cambridge University, and Laboratory, Stables, and Post-mortem Room, of the Brown Institution, Wandsworth-road, London.

† Mr. Sherrington can also perform experiments at the Laboratory, Stables, and Post-mortem Room at the Brown Institution, Wandsworth-road, London.

‡ These certificates are no longer in force.

§ Mr. Tubby can also perform experiments at the Museum, Theatre, and Lecture Rooms, Guy's Hospital, London.

¶ Mr. Mott can also perform experiments at the Physiological and Pathological Departments, University College, London.

** One of these certificates is no longer in force.

†† Mr. Spencer can also perform experiments at the Rooms of the Pathological Department, University College, London.

‡‡ Dr. Klein can also perform experiments at St. Bartholomew's Hospital, London.

§§ Dr. Hunter can also perform experiments at the Rooms and Out-houses of the Laboratory of the Royal Colleges of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination

Board on the Victoria Embankment, W.C.

¶¶ Professor Horsley can also perform experiments at the Physiological Laboratory, University College, London.

After the 21st November, Mr. Mott was authorised to perform experiments at Charing Cross

ENGLAND AND SCOTLAND—continued.

TABLE I.—List of Licensees who performed Experiments under their Licenses and Certificates in 1892—continued.

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
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			A.	B.	C.	D.	E. (always coupled with A. or B.)	F.	
LONDON—continued.									
1	The Rooms and Outhouses of the Laboratory of the Royal Colleges of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment.	Almroth E. Wright, M.D. °	2 †	2 †	-	-	1	-	President of the Royal College of Physicians ; Professor of Physiology, University of Cambridge ; Professor of Physiology, University of Oxford.
1	- - - Ditto - - - ditto	Howard H. Tooth, M.A., M.D. -	-	1	-	-	-	-	President of the Royal College of Physicians ; Professor of Surgery, University College, London ; Professor of Physiology, Univer- sity College, London.
1	- - - Ditto - - - ditto	William A. Turner, M.B. †	-	1	-	-	-	-	President of the Royal College of Physicians ; Professor of Clinical Surgery, King's College, London.
1	- - - Ditto - - - ditto	German S. Woodhead, M.D., F.R.C.P. §	3	-	-	-	1	-	President of the Royal College of Physicians ; Professor of Physiology, University Col- lege, London ; Professor of Physiology, University of Oxford.
1	- - - Ditto - - - ditto	G. E. Cartwright Wood, M.D., B.SC, M.R.C.S.	1	-	-	-	-	-	President of the Royal College of Surgeons, Edinburgh ; Professor of Surgery, Uni- versity of Edinburgh ; President of the Royal College of Physicians ; Professor of Physiology, University of Oxford.
1	- - - Ditto - - - ditto	Marc A. Ruffer, M.D. ¶	2 °°	-	-	-	-	-	President of the Royal College of Physicians ; Holme Professor of Medicine, University College, London ; Professor of Clinical Medicine, University College, London.

1	-	Ditto	-	-	-	-	1	-	-	-	-	-	-	-	President of the Royal College of Physicians ; Professor of Surgery, University College, London ; Professor of Materia Medica, University College, London.
1	-	Ditto	-	-	-	-	1	-	-	-	-	-	-	-	President of the General Medical Council ; Professor of Materia Medica and Thera- peutics, University College, London.
1	-	Ditto	-	-	-	-	1	2†	-	-	-	2†	-	-	President of the Royal College of Physicians ; Professor of Physiology, University of Oxford ; Professor of Surgery, University College, London.
1	-	Ditto	-	-	-	-	1	1	-	-	-	1	-	-	President of the Royal College of Physicians ; Professor of Physiology, University Col- lege, London ; Professor of Physiology, University of Cambridge.
1	-	Ditto	-	-	-	-	1	1	-	-	-	-	-	-	President of the General Medical Council ; Professor of Physiology, University Col- lege, London.
1	-	Ditto	-	-	-	-	1	1	-	-	-	-	-	-	President of the Royal College of Physicians ; Professor of Surgery, King's College, London.
1	-	Ditto	-	-	-	-	1	1	-	-	-	-	-	-	President of the Royal College of Surgeons, England ; Professor of Physiology, Uni- versity College, London.
1	-	Ditto	-	-	-	-	1	-	-	-	-	1	-	-	President of the Royal College of Physicians ; Professor of Surgery, King's College, London.
1	-	Ditto	-	-	-	-	1	-	-	-	-	-	-	-	President of the Royal College of Physicians ; Professor of Medicine, Victoria University (Owen's College), Manchester.
1	-	Ditto	-	-	-	-	1	-	-	-	-	-	-	-	Professor of Physiology, Owen's College, Manchester ; President of the Royal College of Physicians, Edinburgh.
1	-	Ditto	-	-	-	-	1	1	-	-	-	-	-	-	President of the Royal College of Physicians ; Professor of Physiology, University of Cambridge.
1	-	Ditto	-	-	-	-	2†	-	-	-	-	-	-	-	President of the Royal College of Physicians ; President of the Royal Society ; Professor of Physiology, King's College, London.

MANCHESTER:

Owen's College, the Pathological Labo-
ratory.Owen's College, the Physiological Labo-
ratory.

NEWCASTLE-ON-TYNE:

The Physiological Laboratory and Mu-
seum of the University of Durham
College of Medicine, Newcastle-on-
Tyne.

NETLEY:

Army Medical School, Pathological Labo-
ratory.

* Dr. Wright could also perform experiments at the Pathological Laboratory, Cambridge University. After 26th October 1892, Dr. Wright could only perform experiments at the Pathological Laboratory of the Army Medical School, Netley.

† One of these certificates is no longer in force.

‡ Dr. Woodhead can also perform experiments at the Stable and Yard (next to the London, Brighton, and South Coast Railway Line) in the Boundaries-road, Balham.

|| This certificate is no longer in force.

¶ This license is no longer in force.

** After the 10th November 1891 Dr. Heron could only perform experiments at the Rooms and Outhouses of the Laboratory of the Royal College of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment, W.C.

†† After the 12th December 1892, Mr. Edkins could only perform experiments at the Laboratory, Stables, and Post-mortem Room of the Brown Institution, Wandsworth-road.

** These certificates are no longer in force.

** These certificates are no longer in force.

ENGLAND AND SCOTLAND—continued.

TABLE I.—List of Licensees who performed Experiments under their Licenses and Certificates in 1892—continued.

NAMES OF REGISTERED PLACES.		NAMES OF LICENSEES.		Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
				Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
				A.	B.	C.	D.	(A. or B.)	F.	
OXFORD:										President of the General Medical Council ; Professor of Physiology, University of Oxford. President of the Royal Society ; Pro- fessor of Physiology, University College London. President of the Royal College of Physicians ; Professor of Surgery ; President of the Royal College of Surgeons of Edinburgh. President of the Royal College of Physicians ; Professor of Physiology, University of Oxford. President of the Royal Society ; President of the General Medical Council ; President of the Royal College of Physicians. President of the Royal College of Physicians ; Professor of Physiology, University of Oxford.
1	Physiological Laboratory, University Museum.	A. F. Stanley Kent, M.A. ^c		-	-	-	-	-	-	
1	- Ditto - - ditto - -	Leonard Hill, M.B., M.R.C.S., L.R.C.P.		-	-	-	-	-	-	
1	- Ditto - - ditto - -	John S. Haldane, M.A., M.D.		-	-	-	-	-	-	
1	- Ditto - - ditto - -	Bertram Hunt, M.B., B.A., M.R.C.S. [†]		1 [†]	-	-	-	-	-	
1	- itto - - ditto - -	J. Burdon-Sanderson, M.D., F.R.C.S., F.R.S. [§]		1	-	1	-	-	-	
1	- Ditto - - ditto - -	James L. Smith, M.A., M.B.		-	1	-	-	1	-	
WAKEFIELD:										
1	The Pathological Museum and Labo- ratory at the West Riding Asylum at Wakefield.	Edwin Goodall, M.D.		2 ¶	2 ^{sc}	-	-	-	-	
TOTAL				92	75	21	1	334	4	
				125						

^c After 12th December 1892, Mr. Kent could also perform experiments at the Physiological Laboratory of the Medical School of St. Thomas's Hospital and the Laboratory, Stables and Post-mortem Room of the Brown Institution, Wandsworth-road, S.W.

[†] Dr. Burdon-Sanderson is not restricted to the registered place, so far as relates to the performance of experiments under his license; and he could only perform experiments under his certificate in Column 3 in the registered places in University College, London.

^{||} Previous to the 25th January 1892, Mr. Goodall could only perform experiments at the Physiological and Pathological Laboratories, Owen's College, Manchester.

[¶] One of these certificates is no longer in force.

^{sc} These certificates are no longer in force.

TABLE II.
LIST of LICENSEES who performed No EXPERIMENTS under their LICENSES and CERTIFICATES in 1892, and List of Registered Places at which No Experiments were performed.

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
			A.	B.	C.	D.	E.	F.	
1	ABERDEEN: University, Pathological Laboratory	Francis Kelly, M.B.*	-	1†	-	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Physiology, University of Aberdeen.
-	The Medical Jurisprudence Laboratory and Class Room in the University of Aberdeen.	-	-	-	-	-	-	-	-
1	ALDERSHOT: The Army Veterinary School, P Lines, South Camp, Aldershot.	Fred Smith, M.R.C.V.S.*	-	-	-	-	-	-	Regius Professor of Medicine, University of Oxford; Professor of Physiology in the University of Oxford; President of the Royal College of Veterinary Surgeons.
-	BRISTOL: The Western Counties Laboratory, con- sisting of Two Rooms, forming part of No. 17, Park-street, Bristol, but entirely distinct from, and having no connection with, any other part of the said 17.	-	-	-	-	-	-	-	-
1	CAMBRIDGE: University, Physiological Laboratory, New Museum.	Walter H. Gaskell, M.A.*	-	-	-	-	-	-	President of the Royal Society; Professor of Anatomy in University of Cambridge.
1	- - - ditto	A. S. Lea, M.A.	-	-	1	-	-	-	President of the Royal Society; Professor of Anatomy in the University of Cam- bridge.

* This license is no longer in force.

† This certificate is no longer in force.

ENGLAND AND SCOTLAND—*continued.*TABLE II.—List of Licensees who performed No Experiments under their Licenses and Certificates in 1892, &c.—*continued.*

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Assea. F.	
1	CAMBRIDGE— <i>continued.</i> University, Physiological Laboratory, New Museum.	Walter Heape, M.B., hon. M.A. (Camb.)	-	1	-	-	-	-	President of the Royal Society; Professor of Physiology, Cambridge University; President of the Royal College of Physi- cians.
1	University, Pathological Laboratory	Ernest L. Jones, M.B., B.C.	1	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, Cambridge University.
1	- - - Ditto	George Cunningham, M.A.*	-	1	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge; Professor of Anatomy, Uni- versity of Cambridge.
1	- - - Ditto	A. C. Latham, B.A.	1	1	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	DUNDEE: The portion of the Physiological Depart- ment in the Chemical Laboratory Building of the University College, Dundee.	C. W. Reid, B.A., M.B.	-	-	1	-	-	-	President of the Royal Society; Professor of Physiology, University of Cambridge.

EDINBURGH:

1	University, Physiological Department	D. Noel Paton, M.D., C.M.†	-	-	2	-	-	-	President of the Royal College of Physicians, Edinburgh; Professor of Physiology and Institutes of Medicine, University of Edinburgh; Professor of Anatomy, University of Edinburgh; President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Materia Medica, University of Edinburgh; President of Royal College of Surgeons, Edinburgh.
1	University, Materia Medica Department	A. E. Morrison	-	-	1	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Surgery, University of Edinburgh.
1	The Rooms and Outhouses of the Laboratory of the Royal College of Physicians, 7, Lauriston-lane, Edinburgh.	George M. Cullen, M.B., C.M.‡	-	-	1§	-	-	-	President of the Royal College of Physicians, Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - Ditto - - ditto	J. M. Balfour, M.D., C.M.‡	-	1§	-	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - Ditto - - ditto	John Macpherson, M.B., M.R.C.P.E.	1	-	1	-	1§	-	President of the Royal College of Surgeons, Edinburgh; Professor of Surgery, University of Edinburgh.
1	- - Ditto - - ditto	Henry M. Chassaud, M.B.‡	-	-	1§	-	-	-	President of the Royal College of Physicians, Edinburgh; Professor of Materia Medica, University of Edinburgh.
1	- - Ditto - - ditto	R. J. A. Berry, M.B., &c.	-	-	1	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Clinical Surgery, University of Edinburgh.
1	Park-place Medical School, Park-place	Robert F. C. Leith, M.A., M.B.	-	-	-	-	-	-	President of the Royal College of Physicians, Edinburgh; Professor of Surgery, University of Edinburgh.
1	The Laboratory and Physiological Class Room of the Veterinary College, Edinburgh.	William Russell, M.D.	-	1	-	-	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Medical Jurisprudence, University of Edinburgh.

* Mr. Cunningham can also perform experiments at the Brown Institution, Wandsworth-road, London.

† Dr. Paton can also perform experiments at the Physiological Laboratory, Surgeons' Hall, Edinburgh, and the Room and Outhouses of the Laboratory of the Royal College of Physicians, 7 Lauriston-lane, Edinburgh.

‡ This license is no longer in force.

§ This certificate is no longer in force.

ENGLAND AND SCOTLAND—*continued.*TABLE II.—List of Licensees who performed No Experiments under their Licenses and Certificates in 1892, &c.—*continued.*

	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
			Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. B. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
1	EDINBURGH— <i>continued.</i> The New Veterinary College, 41, Elm- row, Edinburgh. The Department of Medical Jurispru- dence in the University of Edinburgh. University, Pathological Department, New Buildings. University, Practice of Physic Depart- ment.	William Williams ° -	1 †	-	-	-	-	1 †	Professor of Anatomy in University of Edin- burgh; President of the Royal College of Physicians, Edinburgh; President of the Royal Society of Edinburgh.
			-	-	-	-	-	-	
			-	-	-	-	-	-	
			-	-	-	-	-	-	
1	GLASGOW: University, Physiological Laboratory and Physiological Class Room.	William Snodgrass, M.A., M.D., C.M.	-	-	-	-	-	-	President of the Faculty of Physicians and Surgeons of Glasgow; Professor of Prac- tice of Medicine, University of Glasgow.
1	University, Physiological Laboratory	Joseph Coats, M.D.	2 †	-	-	-	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Medicine, University of Glasgow; Professor of Ma- teria Medica, University of Glasgow; Professor of Physiology, University of Glasgow.

1	- - Ditto - - ditto	John G. McKendrick, M.D., F.R.S.	-	-	-	-	-	-	-	1	-	-	-	-	-	President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Anatomy, University of Glasgow; President of the Royal Society; Professor of Practice of Medicine, University of Glasgow.
1	The Surgical Class Room and Surgical Laboratory in the University of Glasgow.	William MacEwen	-	-	-	-	-	-	-	1	-	-	-	-	-	President of the Royal Society; Professor of Physiology, University of Glasgow.
1	The Medical Department of St. Mungo's College, Glasgow.	John Barlow, M.D., F.R.C.S.	-	-	-	-	-	-	-	1	-	-	-	-	-	President of the Faculty of Physicians and Surgeons of Glasgow; Professor of Physiology in the University of Glasgow.
1	LEYTON: The Front Room downstairs of 6, Delapine-terrace, High-road, Leyton, Essex. §	Albert Wilson, M.D.*	-	-	-	1 †	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Clinical Surgery in King's College, London.
1	LONDON: University College, London; the new Physiological Theatre, and the Rooms comprised in the Physiological Laboratory, together with the Curator's Room; also the Rooms of the Pathological Department.	Henry Head, M.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.
1	- - Ditto - - ditto	Andrew Wm. Orr, M.D.	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.
1	The Pathological Department, University College, London.	William Page May, M.D., B.Sc.	-	-	-	-	1	-	-	-	-	-	1	-	-	President of the Royal College of Physicians; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	Dudley Wilmot Buxton, M.D.	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Surgery, University College, London.
1	- - Ditto - - ditto	Alexander Haig, M.D., F.R.C.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Oxford.

† This certificate is no longer in force.

§ This place is no longer on the Register.

‡ One of these certificates is no longer in force.

ENGLAND AND SCOTLAND—continued.

TABLE II.—List of Licensees who performed No Experiments under their Licenses and Certificates in 1892, &c.—continued.

Certificates held by each Licensee.									
	NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Special for	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthetics.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Discoveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E.	Permitting Experiments on Horses, Mules, or Asses. F.	Scientific Authorities recommending Licenses and granting Certificates.
			Experiments without Anæsthetics.	A.	B.	C.	D.	(always coupled with A. or B.)	
LONDON—continued.									
1	King's College, Physiological Laboratory	Thomas G. Brodie, M.B.C.S., L.R.C.P.	-	-	-	-	-	-	Professor of Physiology, King's College, London; President of the Royal Society.
1	- - Ditto - - ditto	William Watson Cheyne, M.D., F.R.C.S. †	2 §	-	-	-	-	-	President of the Royal College of Surgeons, England; Professor of Clinical Surgery, King's College, London; Professor of Physiology, King's College, London.
1	Bacteriological Laboratory, King's Col- lege, London.	Phineas S. Abraham, M.D., F.R.C.S.I.	1	-	-	-	-	-	President of the Royal College of Phy- sicians; Professor of Anatomy, University of Cambridge.
1	The Laboratory for Surgical Pathology, King's College, London.	W. R. Smith, M.D., D.sc. -	1	-	-	-	-	-	President of the Royal College of Phy- sicians.
1	St. Bartholomew's Hospital, London; portion of building used by Medical School.	Henry Lewis Jones, M.D.	1	-	-	-	-	-	President of the Royal College of Phy- sicians; Professor of Physiology, Uni- versity of Cambridge.
1	- - Ditto - - ditto	Henry J. Tylden, M.B., M.R.C.P. o q	1 †	1 †	-	-	-	1 †	President of the Royal College of Phy- sicians; Professor of Physiology, Uni- versity of Cambridge; Professor of Physiology, University College, London.

1	Guy's Hospital, London; the Museum, Theatre, and Lecture Rooms.	W. H. White, M.D., M.R.C.S.	-	-	-	-	-	-	1	Professor of Physiology, University of Cambridge; President of the General Medical Council; President of the Royal College of Physicians.
1	- - Ditto - - ditto	William Arbuthnot Lane, M.S.	-	-	-	-	-	-	1	President of the Royal College of Physicians; Professor of Physiology, University College, London.
1	The Royal Veterinary College, Camden Town; the Sheds and loose Boxes occupying the north-east part of the buildings, together with the Demonstrator's Room adjoining the Dissecting Room.	Geo. Thos. Brown, M.R.C.V.S.	1	-	-	-	-	-	-	President of the Royal Society; President of the Royal College of Surgeons, England.
1	St. Mary's Hospital, Paddington; the Physiological Laboratory, and adjoining Lecture Theatre.	J. Jackson Clarke, M.B., F.R.C.S.	1	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Surgery, University of Cambridge.
1	Brown Institution, Wandsworth-road, London; the Laboratory, Stables, and Post Mortem Room.	Frederick S. Eve, F.R.C.S.E.	-	-	-	-	-	-	1†	President of the Royal College of Surgeons, England; Professor of Surgery, University College, London; President of the Royal Society; Professor of Medicine, University College, London.
1	- - Ditto - - ditto	George J. Romanes, M.A., F.R.S.	-	-	-	-	-	-	2§	President of the Royal College of Physicians; Professor of Surgery, University College, London; President of the Royal College of Surgeons, England; Professor of Physiology, University of Oxford.
1	- - Ditto - - ditto	Thomas Dyke Acland, M.D., F.R.C.P. ††	2	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University of Cambridge.
1	- - Ditto - - ditto	Carl Menge, M.D. (Munich)	1†	-	-	-	-	-	-	President of the General Medical Council; Regius Professor of Medicine, University of Oxford.

* This license is no longer in force.

† Mr. Watson Cheyne can also perform experiments at the Brown Institution, Wandsworth-road; at the Rooms and Out-houses of the Laboratory of the Royal College of Physicians and Surgeons (London and England), situated in the building of the Conjoint Examination Board on the Victoria Embankment; and at the Laboratory of Surgical Pathology, King's College, London.

‡ One of these certificates is no longer in force.

¶ After the 22nd March, Mr. Tyden could only perform experiments at the Laboratories, Victoria Embankment, London.

** Mr. G. T. Brown may also perform experiments under the certificate dispensing with the use of anaesthetics, at such places as may be necessary, provided that when reporting the result to the inspector, he shall state the name of the place or places where the experiments have been performed.

†† Professor Romanes can also perform experiments at the Physiological and Pathological Laboratories, University College, London.

‡‡ After 23rd December 1892, Dr. Acland could also perform experiments at the Pathological Laboratory, Cambridge University, and St. Thomas Hospital, London.

ENGLAND AND SCOTLAND—*continued*.TABLE II.—List of Licensees who performed No Experiments under their Licenses and Certificates in 1892, &c.—*continued*.

NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by each Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
		Special for Experiments without Anæsthetics.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia.	Permitting Experiments in Illustration to Lectures.	For the further Advance- ment of Knowledge by testing previous Dis- coveries.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asses. F.	
LONDON— <i>continued</i> . The Rooms and Outhouses of the Laboratory of the Royal Colleges of Physicians and Surgeons (London and England), situated in the building of the Con-joint Examination Board on the Victoria Embankment.	1 - - Ditto - - ditto - -	-	2°	-	-	2*	-	President of the Royal College of Physicians; Professor of Surgery, University College, London; Professor of Physiology, University College, London.
1 - - Ditto - - ditto - -	Frederick B. Jessett, F.R.C.S.	1†	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.
1 - - Ditto - - ditto - -	Frank J. Wethered, M.D.†	-	1†	-	-	1†	-	President of the Royal College of Physicians, Edinburgh; Professor of Medicine, University of Glasgow.
1 - - Ditto - - ditto - -	Alexander William Macfarlane, M.D.†	-	1†	-	-	-	-	President of the Royal College of Physicians, England; Professor of Physiology, University College, London.
1 - - Ditto - - ditto - -	Robert Cozens Bailey, M.B.C.S.†	-	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology in University College, London; Professor of Forensic Medicine in University College, London; Professor of Physiology, University of Oxford.
1 - - Ditto - - ditto - -	F. W. Pavy, M.D., F.R.S.	2°	-	-	-	1	-	—
- London Hospital Medical College -	-	-	-	-	-	-	-	-

MANCHESTER:									
1	Owen's College, Physiological and Pathological Laboratories.	William Stirling, M.D., F.R.S.E.	-	-	-	1	-	-	President of the Royal College of Surgeons, Edinburgh; Professor of Anatomy in the University of Aberdeen; President of the Faculty of Physicians and Surgeons, Glasgow; Professor of Anatomy, Owen's College, Manchester.
-	Owen's College, the Toxicological Laboratory.	-	-	-	-	-	-	-	-
NEWCASTLE-ON-TYNE:									
1	The Physiological Laboratory and Museum of the University of Durham College of Medicine, Newcastle-on-Tyne.	Thomas Oliver, M.D., M.R.C.P.	1	-	-	1	-	-	President of the Royal College of Physicians; Professor of Medicine in the University of Durham.
1	Room 46 of the University College, Nottingham.	E. B. Truman, M.D.	2	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology in University College, London; Professor of Medical Jurisprudence in University College, London; President of the Royal College of Surgeons, England; Professor of Surgery, University College, London.
-	Room 50 in the University College, and one of the Workshops on the upper floor of the Technical School, Nottingham.	-	-	-	-	-	-	-	-
OXFORD:									
1	The Laboratory in the University Museum (specifically described as the new building completed in 1892), Oxford.	E. Ray Lankester	1	-	-	-	-	-	President of the Royal Society.
-	Anatomical Department, University Museum.	-	-	-	-	-	-	-	-
PLYMOUTH:									
-	The Laboratory of the Marine Biological Association.	-	-	-	-	-	-	-	-
WAKEFIELD:									
1	The Pathological Museum and Laboratory at the West Riding Asylum at Wakefield.	W. Bevan Lewis, L.R.C.P.	1	-	-	-	-	-	President of the Royal College of Physicians; Professor of Physiology, University College, London.
WOOLWICH:									
1	The Royal Horse Infirmary	Francis Raymond, F.R.C.V.S.	1	-	-	-	-	1	President of the Royal College of Surgeons, England; President of the Royal College of Veterinary Surgeons; Resident Professor of the Royal Veterinary College, Camden Town; Professor of Physiology, King's College, London.
55		TOTAL	29	23	10	1	15	2	

† This certificate is no longer in force.

† This license is no longer in force.

§ Mr. Bailey can also perform experiments at the registered places of the Royal Veterinary College, Camden Town, N.W.

* One of these certificates is no longer in force.

ENGLAND AND SCOTLAND—continued.

TABLE III.

SHOWING the Number and the Nature of the EXPERIMENTS performed by each LICENSEE.

NAME OF LICENSEE.	Under License.	UNDER CERTIFICATE.						NATURE.			REMARKS.
		A.	B.	C.	D.	E.	F.	Physiological.	Pathological.	Therapeutical.	
Adami, John G.	-	3	-	3	-	-	-	-	3	3	3 painless; 3 inoculations.
Anderson, H. K.	43	-	3	-	-	-	-	40	-	-	43 painless; 3 aseptic wounds.
Andrewes, F. W.	-	20	-	-	-	-	-	-	20	-	Inoculations.
Ballance, Charles, A.	-	-	-	-	-	12 + B	-	-	12	-	Aseptic wounds.
Batten, R. D.	3	-	7	-	-	9 + B	-	19	-	-	3 painless; 16 aseptic wounds.
Bayliss, William M.	68	-	-	-	-	-	-	68	-	-	Painless.
Beavor, Sir H. R.	-	4	-	-	-	-	-	-	4	-	Inoculations.
Bokenham, T. J.	-	58	-	3	-	-	-	-	61	-	3 painless; 58 inoculations.
Bousfield, Edward C.	-	4	-	-	-	-	-	-	4	-	Inoculations.
Boyce, R. W.	-	15	-	-	-	20 + B	-	-	95	-	60 painless; 20 aseptic wounds; 15 inoculations.
Boyd, Francis D.	4	-	-	-	-	-	-	-	4	-	Painless.
Bradford, J. R.	40	-	1	-	-	10 + B	-	51	-	-	40 painless; 11 aseptic wounds.
Bruce, David	21	30	-	-	-	-	-	-	51	-	21 painless; 30 inoculations.
Calvert, James	11	-	-	-	-	-	-	-	11	-	Painless.
Cantley, Edmund	-	-	-	4	-	-	-	4	-	-	Painless.
Carlier, Edmund W.	-	-	3	-	-	-	-	3	-	-	Aseptic wounds.
Cash, Jno. Theodore	29	25	-	3	-	1 + A	-	-	-	58	32 painless; 26 injections.
Chaplin, T. H. A.	-	-	15	-	-	-	-	-	15	-	Inoculations.
Charteris, Matthew	-	40	-	-	-	-	-	40	-	-	Hypodermic injections.
Cheate, G. L.	-	12	-	-	-	-	-	-	12	-	Inoculations.
Cobbett, Louis	-	20	1	-	-	-	-	-	21	-	Inoculations.
Collins, E. T.	-	-	3	-	-	-	-	3	-	-	Aseptic wounds.
Cooper, C. D.	-	-	-	-	-	10 + B	-	-	10	-	Aseptic wounds.

Copeinan, S. A. M.	-	-	16	4	-	-	-	-	-	-	-	-	-	-	-	-	1 + B	-	-	20	-	-	1	16 painless; 4 inoculations. Aseptic wound.
Cotterell, Edward	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dean, Henry Percy	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	9 + B	-	2	9	-	-	-	2 painless; 9 aseptic wounds. Hypodermic injections.
Dean, George	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	Hypodermic injections.
Delpine, Sheridan	-	-	-	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	-	Inoculations.
Dunlop, James C.	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	Painless.
Eddowes, Alfred	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2 + A	-	-	2	-	-	-	Inoculations.
Edgeworth, F. H.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 + B	-	5	-	-	-	-	Aseptic wounds.
Edkins, John S.	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	-	-	Painless.
Edmunds, Walter	-	-	-	-	-	34	-	-	-	-	-	-	-	-	-	-	-	-	-	34	-	-	-	Hypodermic injections.
Fenwick, William S.	-	-	-	14	-	16	-	-	-	-	-	-	-	-	-	-	4 + B	-	34	-	-	-	-	14 hypodermic injections; 20 aseptic wounds and other operative pro- cedures.
Ferrier, David	-	-	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	Aseptic wounds.
Fitzgerald, Gerald	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	Inoculations.
Fletcher, H. M.	-	-	-	36	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	36	-	-	-	Inoculations.
Frankland, Percy F.	-	-	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	-	-	-	Inoculations.
Gerland, Conrad	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	8	-	Inoculations.
Goodall, Edwin	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	Inoculations with aseptic wounds.
Gotch, Francis	-	-	12	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	Painless.
Grünbaum, A. S. F.	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	Aseptic wounds.
Habershon, S. H.	-	-	15	25	-	3	-	-	-	-	-	-	-	-	-	-	-	-	43	-	-	-	-	15 painless; 25 withdrawals of drops of blood; 3 aseptic wounds.
Haldane, J. S.	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	Painless.
Halliburton, W. D.	-	-	32	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	34	-	-	-	-	Painless.
Hankin, E. H.	-	-	-	III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-	-	Inoculations.
Hardy, W. B.	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	Inoculations.
Harris, A. Butler	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	Inoculations.
Harris, V. D.	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	Painless.
Haycraft, Jno. Berry	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	-	-	-	-	Painless.

ENGLAND AND SCOTLAND—continued.

TABLE III.—Showing the Number and the Nature of the Experiments performed by each Licensee—continued.

NAME OF LICENSEE.	Under License.	UNDER CERTIFICATE.						NATURE.			REMARKS.
		A.	B.	C.	D.	E.	F.	Physiological.	Pathological.	Therapeutical.	
Heron, George Allan	-	41	-	-	-	-	-	-	41	-	Inoculations and injections.
Hewlett, Richard T.	-	8	-	-	-	-	-	-	8	-	Inoculations.
Hill, Leonard	23	-	-	-	-	-	-	23	-	-	Painless.
Horsley, Victor	60	4	7	42	-	30 + B	-	-	143	-	102 painless; 37 aseptic wounds; 4 inoculations.
Houston, Alexander C.	-	11	-	-	-	-	-	-	11	-	Inoculations.
Hunt, Bertram	-	22	-	-	-	-	-	-	22	-	Inoculations.
Hunter, William	-	50	-	-	-	-	-	-	50	-	Inoculations.
Johnston, D. W.	-	5	-	-	-	-	-	-	5	-	Inoculations.
Kanthack, Alfred A.	-	50	-	-	-	-	-	-	50	-	37 inoculations; 13 aseptic wounds. ^o
Keng, Lim Boon	4	-	-	-	-	-	-	4	-	-	Painless.
Kent, A. F. Stanley	12	-	-	-	-	-	-	12	-	-	Painless.
Kirk, Robert	-	-	30	-	-	20 + B	-	50	-	-	Inhalations of Anæsthetics.
Klein, E. E.	-	68	-	-	-	-	-	-	68	-	Inoculations.
Langley, J. N.	61	-	-	1	-	-	-	62	-	-	Painless.
Leigh, Randle	6	-	-	-	-	-	-	6	-	-	Painless.
Lockwood, Charles B.	9	9	-	-	-	-	-	9	9	-	9 painless; 9 inoculations.
Lundie, William	1	-	-	-	-	-	-	1	-	-	Painless.
Macdonald, T. Fauset	-	-	-	-	-	-	2 + B	2	-	-	Aseptic wounds.
MacFadyen, Allan	-	25	-	-	-	-	-	-	25	-	Inoculations.
MacGregor, A. N.	-	-	8	-	-	-	-	8	-	-	Aseptic wounds.
MacLennan, William	-	40	-	-	-	-	-	40	-	-	Hypodermic injections.
Marshall, C. D.	6	-	-	-	-	24 + B	-	-	30	-	6 painless; 24 aseptic wounds.

Martin, S.	-	-	-	-	-	365	1	-	-	-	-	-	356	-	-	365 inoculations and feeding experiments; 1 intravenous injection. Inoculation and feeding experiments. Inoculations. Aseptic wounds. 2 painless; 9 injections; 1 aseptic wound. Painless. Painless.
McFadyean, John	-	-	-	-	-	74	-	-	-	10 + A	15 + A	-	89	-	-	Inoculations.
Millais, Everett	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	Aseptic wounds.
Mott, F. W.	-	-	-	-	-	-	7	-	-	-	-	7	-	-	-	2 painless; 9 injections; 1 aseptic wound.
Murray, George R.	-	2	-	-	-	9	1	-	-	-	-	-	3	-	9	Painless.
Murray, Robert M.	-	3	-	-	-	-	-	-	-	-	-	3	-	-	-	Painless.
William, John A.	-	19	-	-	-	-	-	-	-	-	-	19	-	-	-	Painless.
Paget, Stephen	-	-	-	-	-	-	8	-	-	-	-	-	-	-	8	Aseptic wounds.
Parsons, J. H.	-	9	-	-	-	-	6	-	-	4 + B	-	-	-	-	5	9 painless; 10 aseptic wounds.
Paul, Frank Thomas	-	-	-	-	-	-	-	-	-	6 + B	-	-	6	-	-	Aseptic wounds.
Penberthy, John	-	23	-	-	-	-	-	-	-	-	-	-	23	-	-	Painless.
Philip, R. W.	-	-	-	-	-	4	-	-	-	-	-	-	4	-	-	Inoculations.
Pickering, J. W.	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	Painless.
Piotrowski, Gustavus	-	7	-	-	-	-	-	-	-	-	-	7	-	-	-	Painless.
Poole, Thomas D.	-	-	-	-	-	14	-	-	-	-	-	-	14	-	-	Inoculations.
Power, D'Arcy	-	-	-	-	-	-	13	-	-	-	-	-	13	-	-	Inoculations.
Roberts, H. Leslie	-	-	-	-	-	15	-	-	-	-	-	-	15	-	-	Inoculations.
Roy, Charles S.	-	35	-	-	-	-	-	-	-	4 + B	-	-	39	-	-	35 painless; 4 aseptic wounds.
Ruffer, Marc A.	-	-	-	-	-	25	-	-	-	-	-	-	25	-	-	Inoculations.
Russell, J. S. R.	-	44	-	-	-	-	8	-	-	12 + B	-	-	20	-	-	44 painless; 20 aseptic wounds.
Rutherford, William	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	Painless.
Sanderson, J. Burdon	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	Painless.
Schäfer, E. A.	-	-	-	-	-	-	6	-	-	-	-	5	-	-	-	4 painless; 6 aseptic wounds.
Shattock, Samuel G.	-	-	-	-	-	12	-	4	-	-	-	10	-	-	-	Inoculations.
Sherrington, Charles S.	-	67	-	-	-	29	12	11	-	-	-	93	15	-	11	78 painless; 29 inoculations; 12 aseptic wounds.
Shore, Lewis Erle	-	35	-	-	-	-	-	16	-	-	-	51	-	-	-	Painless.
Sillar, W. C.	-	13	-	-	-	-	-	-	-	-	-	-	-	-	13	Hypodermic injections.
Smith, James L.	-	-	-	-	-	-	-	-	-	7 + B	-	-	7	-	-	Aseptic wound.
Spencer, W. G.	-	119	-	-	-	-	-	-	-	-	-	-	119	-	-	Painless.

© For these 13 experiments anaesthetics were given, and they were inadvertently performed under A., in excess of the license.

ENGLAND AND SCOTLAND—continued.

TABLE III.—Showing the Number and the Nature of the Experiments performed by each Licensee—continued.

NAME OF LICENSEE.	Under License.	UNDER CERTIFICATE.					NATURE.			REMARKS.	
		A.	B.	C.	D.	E.	F.	Physiological.	Pathological.		Therapeutical.
Squire, John Edward	-	12	-	-	-	-	-	-	12	-	7 inoculations ; 5 aseptic wounds. ^o
Starling, E. H.	51	-	-	3	-	-	-	54	-	-	Painless.
Steven, John L.	-	2	-	-	-	-	-	-	2	-	Inoculations.
Stevenson, Thomas	-	32	-	-	-	-	-	-	32	-	Hypodermic injections.
Stewart, George N.	10	-	-	-	-	-	-	10	-	-	Painless.
Stockman, Ralph	-	71	-	-	-	-	-	-	-	71	Hypodermic injections.
Symes, William L.	-	16	12	10	-	-	-	38	-	-	16 hypodermic injections ; 12 aseptic wounds ; 10 painless.
Thompson, W. H.	-	-	4	-	-	-	-	4	-	-	Aseptic wounds.
Thomson, H. A.	-	4	-	-	-	-	-	-	4	-	Inoculations.
Thomson, W. E. F.	-	45	-	-	-	-	-	-	-	45	Experiments with choke-damp.
Tillie, Joseph	-	7	-	-	-	-	-	7	-	-	Hypodermic injections.
Tims, H. W. M.	-	-	5	-	-	-	-	5	-	-	Aseptic wounds.
Tooth, Howard H.	-	-	8	-	-	-	-	8	-	-	Aseptic wounds.
Tubby, Alfred H.	-	-	2	-	-	-	-	-	2	-	Aseptic wounds.
Tunnicliffe, F. W.	7	-	-	-	-	-	-	-	-	7	Painless.
Turner, William A.	-	-	9	-	-	-	-	9	-	-	Aseptic wounds.
Walhard, Max	-	-	31	-	-	-	-	-	31	-	Aseptic wounds.
Waring, H. J.	-	10	-	-	-	5 + B	-	5	10	-	10 inoculations ; 5 aseptic wounds.
Washbourn, John W.	-	5	-	-	-	-	-	-	5	-	Inoculations.
Whiting, Arthur J.	-	-	-	-	-	2 + B	-	2	-	-	Withdrawal of blood.
Wood, G. E. Cartwright	-	100	-	-	-	-	-	-	100	-	Inoculations.
Woodhead, German S.	-	483	-	-	-	6 + A	-	-	149	340	Inoculation and feeding experiments.
Workman, Charles	-	2	-	-	-	-	-	-	2	-	Inoculations.
Wright, Almroth E.	25	53	-	-	-	17 + B	-	-	95	-	25 painless ; 53 inoculations ; 17 withdrawal of blood.
TOTAL	1,046	2,239	303	125	-	229	18	1,069	2,290	601	
									3,960		

^o For these five experiments anaesthetics were given, and they were inadvertently performed under A., in excess of the license.

I R E L A N D.

R E P O R T.

8, Ely-place, Dublin,

10 May 1893.

Sir,

I BEG to submit the following Tables, showing the licenses and certificates held in Ireland during the year 1892, under the Act 39 & 40 Vict. c. 77, and the experiments done under them.

Two certificates, B. and E., which were in existence at the period of the last Report in April 1892, expired during that year, and have not been renewed. No new license has been issued, and one license expired during the year.

Fourteen animals have been experimented on during 1892, viz.: 13 rabbits and one dog. All the experiments were done under anæsthetics, were painless, and, in my opinion, directed to useful and proper ends. Five of them were investigations of canine rabies; seven observations of the function of respiration; and two examinations of circulatory phenomena.

I have the honour to be,

Sir,

Your obedient Servant,

W. Thornley Stoker,

Inspector for Ireland.

To the Right Hon.

The Chief Secretary for Ireland.

IRELAND.

TABLE I.

LIST of LICENSEES who performed EXPERIMENTS under their Licenses and Certificates in 1892.

NAMES OF REGISTERED PLACES.		NAMES OF LICENSEES.		Certificates held by Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
Special for Experiments without Anæsthetics. A.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia. B.	Permitting Experiments in Illustration of Lectures (Anæsthetics obligatory). C.	For the further Advancement of Knowledge by testing previous Discoveries. D.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Asseas. F.					
DUBLIN :										
1 The Physiological Lecture Rooms and Laboratory, Carmichael College.	J. Alfred Scott, P.R.C.S.I.	-	1	-	-	1	-	-	A. Meldon, Esq., President Royal College of Surgeons, Ireland ; F. Heuston, Esq., Professor of Anatomy, Royal College of Surgeons, Ireland.	
1 The Physiological Laboratory, 3, Wilton-terrace; the Physiological Laboratory, Carmichael College; and the Physiological Laboratory, Trinity College.	J. M. Purser, M.D.	-	-	-	-	-	-	-	James Little, Esq., President Royal College of Physicians, Ireland.	

TABLE II.

LIST of LICENSEES who performed No EXPERIMENTS under their Licenses and Certificates in 1892.

NAMES OF REGISTERED PLACES.	NAMES OF LICENSEES.	Certificates held by Licensee.						Scientific Authorities recommending Licenses and granting Certificates.
		Special for Experiments without Anæsthetics. A.	Dispensing with the Obligation to Kill the Animal before Recovering from Anæsthesia. B.	Permitting Experiments in Illustration of Lectures (Anæsthetics obligatory). C.	For the further Advancement of Knowledge by testing previous Discoveries. D.	Permitting Experiments on Cats or Dogs, without Anæsthetics. E. (always coupled with A. or B.)	Permitting Experiments on Horses, Mules, or Assea. F.	
DUBLIN : 1 The Physiological Lecture Room, Royal College of Surgeons, the large Lecture Theatre, the small Lecture Theatre, and the Physiological Laboratory, Carmichael College.	Matthew Heddy, Esq., F.R.C.V.S.	-	1	-	-	1	-	H. G. Croly, Esq., President Royal College of Surgeons, Ireland ; W. Stoker, Esq., Professor of Surgery, Royal College of Surgeons, Ireland.

IRELAND—continued.

TABLE III.

SHOWING the Number and the Nature of EXPERIMENTS performed by each LICENSEE during the Year 1892.

NAME OF LICENSEE.	Under License.	UNDER CERTIFICATE.						NATURE.				Pain.
		A.	B.	C.	D.	E.	F.	Physiological.	Pathological.	Therapeutical.	TOTAL.	
J. Alfred Scott, F.R.C.S.I.	-	-	5	-	-	-	-	-	5	-	5	-
J. M. Purser, M.D.	9	-	-	-	-	-	-	9	-	-	9	none.
TOTAL	9	-	5	-	-	-	-	9	5	-	14	

W. Thornley Stoker,
Inspector for Ireland under the Act 39 & 40 Vict. c. 77.

EXPERIMENTS ON LIVING ANIMALS.

RETURN showing the Number of EXPERIMENTS performed on LIVING ANIMALS during the Year 1892, under LICENSES granted under the Act 39 & 40 Vict. c. 77, distinguishing Painless from Painful Experiments (in continuation of Parliamentary Paper, No. 218, of Session 1892).

(*Mr. Herbert Gladstone.*)

*Ordered, by The House of Commons, to be Printed,
4 May 1893.*

[*Price 3½ d.*]

HALL-MARKING (GOLD AND SILVER PLATE).

RETURN to an Order of the Honourable The House of Commons,
dated 9 November 1893 ; —for,

RETURN “ of the CHARGES made for the ASSAY and MARKING of GOLD and SILVER WARES by the Hall-Marking Authorities in the under-mentioned places, with respect to Plate manufactured in the *United Kingdom* and to that Imported from Abroad, and the Statutory Authorities for making such Charges: London, Birmingham, Sheffield, Chester, Edinburgh, Glasgow, and Dublin.”

Board of Trade, }
4 December 1893. }

COURTENAY BOYLE.

(*Mr. Jesse Collings.*)

Ordered, by The House of Commons, to be Printed,
5 December 1893.

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RETURN of the CHARGES made for the ASSAY and MARKING of GOLD and SILVER WARES by the Hall-marking Authorities in the undermentioned places, with respect to Plate manufactured in the *United Kingdom* and to that imported from Abroad, and the Statutory Authorities for making such Charges : London, Birmingham, Sheffield, Chester, Edinburgh, Glasgow, and Dublin.

L O N D O N.

THE Wardens of the Goldsmiths' Company desire that, in complying with the above Return so far as regards Goldsmiths' Hall, the charges in respect of plate manufactured in the *United Kingdom* and that imported from Abroad should be kept entirely distinct.

I. With respect to plate manufactured in the *United Kingdom*, the Goldsmiths' Company exercises its duties under Charters and Acts of Parliament dating back to the year 1300. It is probably unnecessary for the purpose of this Return to enumerate or give the provisions of the Charters and older Statutes; it will be sufficient to refer to the Act 12, Geo. II. c. 26, in the preamble of which will be found references to the earlier Statutes of 28 Ed. I., 2 Hen. VI., 18 Eliz., and 12 Will. III., and also to the Charters of the Company. By the Statute 12 Geo. II. c. 26, it was, among other things, provided (see Sections 13 to 19 inclusive) that certain charges should be permitted in respect of certain named articles of Gold and Silver, and, in addition, by Section 15 that for pieces or parcels of plate weighing above 4 lbs. troy, there should be taken by the Company, in lieu of money payment, a diet not exceeding 10 grains per pound weight troy. Reference to the list of articles contained in Sections 13 to 15 will show at once that the enumeration was even then very incomplete, many common articles being omitted, and many of those included being such as were seldom sent to be marked. During late years, and at the present time, this is still more the case, as a great variety of articles mentioned in that section are now never manufactured, while, on the other hand, numerous articles then unknown are now in common use. By Clause 19 of the same Act it was provided that in case the amount received for assaying and marking of wrought plate should raise more money than should be sufficient to defray the necessary expenses, the overplus should be applied in the first instance towards prosecutions, and, if not required for that purpose, in reduction of the amount to be charged for assaying, the expressed object being that no profit should be made by the Hall Marking Company from the operation. After the passing of that Act, as from time to time fresh articles were brought to be marked, charges were fixed by agreement between the representatives of the trade and Goldsmiths' Hall, based upon, and in proportion to, the scale of charges specified in the above sections. These lists were from time to time extended and varied. A copy of one of such lists, being that in force up to the year 1891, is annexed hereto, marked A.

In the year 1891 the taking of the diet authorised by Section 15 of the Act 12, Geo. II., c. 26 was found so inconvenient, that, by agreement with the representatives of the trade, an arrangement was made that a charge of $\frac{1}{2}d.$ per ounce in respect of British plate should thenceforward be made in lieu of the diet of 10 grains per pound weight troy. It was not found possible to include foreign plate in this arrangement. A copy of the list of charges in force subsequent to the above arrangement is annexed hereto, marked B. It should be mentioned that, owing to the thorough examination made at the Goldsmiths' Hall, every single article, and every part of such article, being separately assayed, a very large staff has had to be employed, and for many years the expenses of the Assay Office have considerably exceeded the returns from the fees received.

II. As regards plate imported from abroad, it is necessary to keep distinct the periods before and after the passing of the Act of 1883 (46, 47 Vict. c. 55). Prior to that date all imported plate requiring to be assayed

was sent to Goldsmiths' Hall by a maker, already stamped with his (the dealer's) name mark, so that arrangements which were applicable in the case of plate manufactured in the United Kingdom applied to plate imported from abroad, except that foreign plate was always sent to the Hall in a finished state. These arrangements, which were regulated by Statute, reduced the labour of the officials at Goldsmiths' Hall to certain distinct duties. Thus, by Section 11 of 12 Geo. II. c. 26, and by the regulations made by the Wardens, the British manufacturer is required to send his plate to the Hall in one parcel and in an unfinished state. He must send it at a fixed hour in the morning, with his name mark already struck upon each article, and his messenger delivers the plate in a loose bag to the proper assay officer. He also prepares and delivers to the officer under Section 9 of the same Act a note or ticket on a prescribed form, giving a list of the various articles sent, their weight, and the charges for marking them. The messenger then leaves the plate and calls at a fixed time later in the day for the purpose of receiving and removing the same. The charges are paid before the plate leaves the office; no receipt is required. If any portion of the plate is below the legal standard the whole packet is liable to be condemned. The duties of the assay officers are confined to examining and weighing the plate for the purpose of checking the manufacturer's note or ticket, to "drawing" a small portion of the metal from each article, assaying the metal so "drawn," and then impressing the hall marks upon the various articles. [See also 5 and 6 Vict. c. 47 secs. 59 and 60.]

Prior, therefore, to the year 1883, plate imported from abroad, and sent to be assayed, had been dealt with practically in the same way as plate manufactured in the United Kingdom, but by the Act already referred to (46 & 47 Vic. c. 55), Section 10, the duty was imposed upon the Customs of sending the plate to Goldsmiths' Hall for assay prior to its being allowed to go out of bond. In consequence of this change, the duties which had to be performed by Goldsmiths' Hall in the case of plate imported into the United Kingdom are very different. The following is a brief summary of the work which has to be performed. The plate is brought to Goldsmiths' Hall at any time in the day during business hours, securely fastened in packing cases, often of considerable size, and in the custody of a Custom House official, for whom the assay officer has in the first instance to prepare and sign a formal receipt. The assay officer has then to open the cases, and unpack and weigh the contents, which are frequently divided into a number of separate parcels, each one of which the importer expects and requires to be treated as a separate delivery, in order that, should one parcel only be below standard, the whole consignment may not be condemned. The assay officer then has himself to prepare two notes or lists of the various articles, with weights of the packet, and mark the prices. He next has to fill up and dispatch by post a special form of certificate of assay for the Customs, and also a similar certificate of the result of assay for the importer, with a statement of the charges, and he also subsequently prepares and delivers to the importer a receipt for the amount paid. An assay report in detail has then to be made dealing with the various separate packets contained in the case. The assay officer has next to put upon each article the name mark of the importer, often following his instructions as to the position in which the name mark shall be placed. When the plate is proved to be up to standard, it is again weighed and repacked for delivery to the importer, who not infrequently leaves the case in the custody of the officials for two or three weeks. When the plate is proved to be below standard it is similarly repacked by the assay officers, and re-delivered to the Customs under seal. The plate is delivered, whether to the importer or to the Customs, at any time during business hours. It will be seen from the above that the assay officers perform for the importers of foreign plate several offices which British manufacturers are required to undertake themselves, together with some additional duties inseparable from the treatment of foreign plate; and it must also be remembered that foreign plate is sent to the Assay Office in a highly finished state, and that this necessitates extra care and trouble on the part of the officers. The cost of assaying and marking foreign plate, including the charge for the additional services above mentioned, averages 2·421*d.* per ounce.

Practically the whole of the foreign plate imported into England is dealt with at Goldsmiths' Hall.

(A.)

ASSAY OFFICE, GOLDSMITHS' HALL, LONDON.

PRICES to be taken for Assaying and Marking Plate.

GOLD WORK.		s.	d.	Silver Work—continued.		s.	d.
Each Watch Case, or Box	- - -	-	9	Each Cheese Knife	- - -	-	-
Each Pendant	- - -	-	3	Pair of Snuffers	- - -	-	-
Each Sword Hilt, or Watch Chain	- - -	1	6	Canister	- - -	-	-
Each Hook or Cane Head	- - -	-	-	Lancet Case	- - -	-	3
Frame for Picture	- - -	-	-	Table Bell, or	- - -	-	-
Tooth-pick Case	- - -	-	-	Taper Candlestick	- - -	-	-
Coral Socket	- - -	-	-	Each Belt Buckle	- - -	-	-
Spectacle Frame	- - -	-	-	Lock	- - -	-	2½
Seal	- - -	-	10	Runner and Pendant, or	- - -	-	-
Medal	- - -	-	-	Pieces of Guns or Pistols	- - -	-	-
Spoon	- - -	-	-	Each Watch Case, or Box	- - -	-	-
Badge	- - -	-	-	Muffiner	- - -	-	-
Pencil Case	- - -	-	-	Book Clasp	- - -	-	-
Pap Boat	- - -	-	-	Pen Holder	- - -	-	-
Each Buckle, or	- - -	-	5	Crest	- - -	-	-
Piece of Chain	- - -	-	-	Pickle Fork	- - -	-	-
Each Snuff Box, or	- - -	1	3	Hinge	- - -	-	-
other Box	- - -	-	-	Tea-pot Handle	- - -	-	-
Each Thimble	- - -	-	-	Grape Scissors	- - -	-	-
Brooch, or	- - -	-	-	Pap Boat	- - -	-	-
Slide	- - -	-	6	Escallop Shell	- - -	-	-
Key	- - -	-	-	Punch Ladle	- - -	-	-
Split Ring	- - -	-	-	Pierced Ladle	- - -	-	-
Blade	- - -	-	-	Sauce Ladle	- - -	-	-
Each Pair of Sleeve Buttons	- - -	-	2	Basin	- - -	-	-
Each Ring	- - -	-	-	Bracelet	- - -	-	-
Coat, or	- - -	-	1	Crosslet	- - -	-	-
Breast Button	- - -	-	-	Boatswain's Call	- - -	-	-
Other Gold Work, weighing 30 oz. or	- - -	2	6	Milk Ewer	- - -	-	-
under	- - -	-	-	Pepper Box	- - -	-	2
above 30 to 50 oz. and so in	- - -	3	9	Bottle Stand	- - -	-	-
proportion	- - -	-	-	Castor	- - -	-	-
Least Parcel of Gold	- - -	1	3	Knife Rests	- - -	-	-
				Boat	- - -	-	-
				Fruit Spoon	- - -	-	-
				Medal	- - -	-	-
SILVER WORK.				All small Mugs or Cups, &c., under a			
On Large Plate, weighing above 4 lbs. (48 ozs.)				Pint	- - -	-	-
a Diet of 10 grs. per lb. Troy.				Ash Tray	- - -	-	-
Shoe Clasps	- - -	-	9	Shaving Brush Case	- - -	-	-
Sleeve Buttons, or	- - -	-	-	Scissors	- - -	-	-
Studs, per doz.	- - -	-	-	Trumpet	- - -	-	-
Each Sword Hilt	- - -	-	-	Dog Collar	- - -	-	-
Frame for Cruets	- - -	-	-	Larding Pin	- - -	-	-
Dish Stand	- - -	-	5	Paper Knife	- - -	-	-
Cock	- - -	-	-	Garnishes	- - -	-	-
Ink Stand	- - -	-	-	Sugar Scoop	- - -	-	-
Dish Cross	- - -	-	-	Snuffer Bow, or	- - -	-	-
Argyle	- - -	-	-	Scissors ditto	- - -	-	-
Bread Rack	- - -	-	-	Each Orange Strainer	- - -	-	-
Each Badge	- - -	-	-	Saltcellar	- - -	-	-
Flower Frame	- - -	-	-	Nutmeg Grater	- - -	-	-
Butter Cooler	- - -	-	4	Napkin Ring	- - -	-	-
Shaving Pot	- - -	-	-	Butter Knife	- - -	-	-
Bottle, or	- - -	-	-	Skewer	- - -	-	-
Lamp	- - -	-	-	Mustard, or	- - -	-	-
Each Coral Socket	- - -	-	-	Egg Spoons	- - -	-	-
Snuff and other Boxes	- - -	-	-	Pair of Tea Tongs	- - -	-	-
Pair of Spurs	- - -	-	-	Haft	- - -	-	-
Dozen of Tea Spoons	- - -	-	-	Small Blade	- - -	-	-
Seals	- - -	-	-	Fork	- - -	-	1
Buttons	- - -	-	-	Caddy Ladle	- - -	-	-
Salt Shovels	- - -	-	3½	Bottle Ticket	- - -	-	-
Strainers	- - -	-	-	Wrist Band	- - -	-	-
Salt Ladles, or	- - -	-	-	Watch Pendant	- - -	-	-
Pieces to Garnish Cabinets	- - -	-	-	Cruet Top	- - -	-	-
Knife Cases	- - -	-	-	Spout	- - -	-	-
Tea Chests, or	- - -	-	-	Seal	- - -	-	-
Bridles	- - -	-	-	Tongue Scraper	- - -	-	-
Each Small Wire Basket	- - -	-	-	Pencil Case, or	- - -	-	-
Small Pierced Basket	- - -	-	-	Single Cigar Tube	- - -	-	-
Mustard Can	- - -	-	3	Pair of Buckles	- - -	-	-
Funnel	- - -	-	-	Least Parcel of Silver	- - -	-	5
Trowel	- - -	-	-				
Fish Knife	- - -	-	-				

Ordered by the Wardens, that your Name Mark be struck fair before sent to Hall, so that the same be perfect when the Work is finished; and that the Note for the Delivery of Goods sent to be Marked be made out in the same manner as the Notes sent with the Work in the Morning with a Receipt at the bottom.

William Robinson, Deputy Warden.

(B.)

ASSAY OFFICE, GOLDSMITHS' HALL, LONDON.

PRICES to be taken for Assaying and Marking Silver Plate.

Wares Weighing Five Ounces each and upwards, and Spoons and Forks Weighing Five Ounces and upwards per Dozen, One Halfpenny per Ounce.

Wares Weighing less than Five Ounces, as under.

	s.	d.		s.	d.
Badges - - - - - each	-	4	Hand Mirrors - - - - - each	-	3
Baskets - - - - - "	-	3	Handles - - - - - "	-	2
Basins or Boats - - - - - "	-	3	" under ozs. .50 - - - - - "	-	1
" " under 2 ozs. - - - - - "	-	2	Hafts - - - - - "	-	1
Blades or Prongs - - - - - "	-	1	Hunting Horns - - - - - "	-	3
Bracelet, Clasps, or Medals - - - - - "	-	2	Ice Spades - - - - - "	-	2
Bells - - - - - "	-	3	Inkstands - - - - - "	-	5
Boxes or Bottles - - - - - "	-	3	" Mounts - - - - - "	-	2
" " Combinations - - - - - "	-	6	Knife Rests - - - - - "	-	2
" " under 2 ozs. - - - - - "	-	2	Ladles or Sifters - - - - - "	-	2
" " Combinations - - - - - "	-	4	Lamps - - - - - "	-	4
Bottle Stands - - - - - "	-	2	" Mounts or Dippers - - - - - "	-	2
" Tickets or Book-markers - - - - - "	-	1	Match Cases - - - - - "	-	2
Breakfast Frames - - - - - "	-	3	Mugs or Cups - - - - - "	-	3
Buckles - - - - - "	-	2	" under 2 ozs. - - - - - "	-	2
Butter Coolers - - - - - "	-	4	Muffineers or Mustard Pots - - - - - "	-	3
" Knives - - - - - "	-	1	" " under 2 ozs. - - - - - "	-	2
Buttons - - - - - per doz.	-	3	Mounts or Garnishes - - - - - "	-	2
Brush Backs - - - - - each	-	3	Napkin Rings - - - - - "	-	1
" " under 2 ozs. - - - - - "	-	2	Pencil Case or Penholders - - - - - "	-	1
Caddy or Canister - - - - - "	-	5	" " Combinations - - - - - "	-	3
Call or Whistle - - - - - "	-	2	Pepper Mills, or Mounts for - - - - - "	-	5
Candlestick or Taper - - - - - "	-	3	Pickle Forks - - - - - "	-	1
Carriage Lamps - - - - - "	1	-	Pipe Bands and Collars - - - - - "	-	1
Chains - - - - - "	-	2	Photo Frames (Double) - - - - - "	-	5
Chatelaines - - - - - "	-	6	" (Single) - - - - - "	-	3
" Appendages - - - - - "	-	2	Salt Cellars - - - - - "	-	2
" " Combinations - - - - - "	-	4	" " under 2 ozs. - - - - - "	-	1
Chalice, Flagon, or Paten - - - - - "	-	3	Salt, Mustard, Tea or Egg Spoons, per doz.	-	3
" " under 2 ozs. - - - - - "	-	2	Scissors - - - - - each	-	2
Cigar Rims - - - - - "	-	2	Shaving Brush Case - - - - - "	-	2
Clips - - - - - "	-	2	Skewers (Fancy) - - - - - "	-	1
Coffee, Cocoa, or Shaving Pot - - - - - "	-	5	Spring, Screw, or Bayonet Caps - - - - - "	-	2
Coral Sockets - - - - - "	-	3	" " single Screw - - - - - "	-	1
Comb Mounts - - - - - "	-	2	Shoe Lifts - - - - - "	-	2
Crests - - - - - "	-	2	Spurs - - - - - per pair	-	6
Cruet Frames - - - - - "	-	5	Sword Hilts - - - - - each	-	5
" Tops - - - - - "	-	1	Trays - - - - - "	-	3
Crumb or Cheese Scoops - - - - - "	-	3	" under 2 ozs. - - - - - "	-	2
Dressing Case Covers - - - - - "	-	2	Tea Pots - - - - - "	-	5
Dog Collars - - - - - "	-	5	Telescope Cups - - - - - "	-	4
" Plain Band - - - - - "	-	2	Thimbles - - - - - per doz.	-	3
Egg Boilers - - - - - "	-	5	Toast Racks - - - - - each	-	5
Ewers - - - - - "	-	3	Toasting Forks - - - - - "	-	3
" under 2 ozs. - - - - - "	-	2	Trowels - - - - - "	-	3
Escallop Shells - - - - - "	-	2	Tongs or Nippers - - - - - "	-	1
Funnels - - - - - "	-	2	Tongue Scrapers - - - - - "	-	1
Flower Vases - - - - - "	-	2	Watch Stands - - - - - "	-	3
Grape Scissors - - - - - "	-	3			

Any wares weighing less than three ounces, if made out of one piece without a joint, and sent in quantities not less than 24 pieces, each 1d.

Fractions of an ounce in large work to be charged as 1 ounce.

Fractions of a penny to be charged as 1 penny.

Least Parcel of Silver, 5d.

Ordered by the Wardens, that your Name Mark be struck fair before sending to Hall, so that the same be perfect when the Work is finished, and that the Hall Notes be correctly and legibly written in duplicate.

W. Robinson, Deputy Warden.

BIRMINGHAM.

Assay Office, Birmingham,
16 November 1893.

Sir,

I HAVE to acknowledge the receipt of your letter of the 13th instant, enclosing copy of an Order of the House of Commons made on the 9th instant.

I have the pleasure of enclosing you a list of the prices charged at this office for the assaying and marking of gold and silver wares manufactured in the United Kingdom and for that imported from abroad. The power to make such charges is conferred on the Guardians by the 5 Geo. IV. c. 52, s. 24. The charges are in every instance within the amounts mentioned in that section, and they are from time to time revised as occasion requires in conformity with the 30th Section of the before-mentioned Act. I have also to inform you that the full weight of the wares is returned to the makers, and that the diet is not appropriated to the use of the Guardians, although it might be so appropriated under the 28th Section of the before-mentioned Statute.

I am, Sir,

for the Guardians of the Standard of Wrought
Plate in Birmingham.

(signed) *Henry Buckley*, Warden.

The Assistant Secretary
(Harbour Department), Board of Trade,
London, S.W.

Enclosure.

Prices to be paid for assaying and marking gold and silver wares on and after the 15th July 1890.

GOLD.	s. d.	SILVER.	s. d.
For each chain or watch case - -	- 5	Wares not exceeding in weight 5 dwts. each (excepting watch pendants) - - - per doz.	- 3
For each locket, bracelet, or necklet pendant - - - - -	- 2	Chains - - - - - per oz.	- 1
For each dozen studs, or links, or rings - - - - -	- 3	Other wares - - - - - „	- ½
For other wares - - - - - each	- 1		
(A pair of gold earrings is charged as one ware.)		Silver earrings are charged separately.)	

Fractions of a penny in the accounts will be charged a penny, and no parcel of gold or silver work will be charged less than one shilling.

The full weight of gold and silver will be returned without stoppage for diet.

SHEFFIELD.

Assay Office, Sheffield,
16 November 1893.

Sir,

IN accordance with the Order of the House of Commons enclosed in your favour, I beg to inform you that silver goods only are assayed and marked at this office.

The charges are as follows :—

Articles not exceeding 10 dwts. in weight each, 3*d.* per dozen.

All other wares, ½*d.* per oz.

the minimum charge for any one parcel being 6*d.*

RETURN RELATING TO

These charges are in each case one-half of the charges allowed by Statute. The same rate is charged for all articles whether manufactured in the United Kingdom or imported from abroad. It is quite the exception for imported silver to be assayed at this office.

The above charges are made by the authority of the under-mentioned Statutes :—

13 Geo. 3, c. 52, ss. 16 and 17.

24 Geo. 3, c. 20, s. 1.

I am, &c.
(signed) *Arnold T. Watson,*
Assay Master.

The Assistant Secretary,
Harbour Department, Board of Trade, S.W.

C H E S T E R.

GOLD.		s. d.	SILVER.		s. d.
For each chain	- - - -	- 5	Wares not exceeding in weight		
For each watch case	- - - -	- 6	5 dwts. each (excepting watch		
For each locket, bracelet, or necklet	- - - -		pendants) - - - per doz.		- 3
pendant	- - - -	- 2	Watch cases - - - per oz.		- 1
For each dozen studs or links or	- - - -		Chains - - - - - "		- 1
rings - - - - -	- - - -	- 3	Other wares - - - - - "		- 1
For other wares - - - - each	- - - -	- 1			
(A pair of gold earrings is charged as one ware.)			(Silver earrings are charged separately.)		

Fractions of a penny in the accounts will be charged a penny, and no parcel of gold or silver work will be charged less than one shilling.

Foreign plate one penny per oz.

The statutory authority for the charges made at the Chester Assay Office for the assay and marking of gold and silver wares is the Act of 12 Geo. 2, c. 26 (1739).

E D I N B U R G H.

GOLD.		s. d.	SILVER.		s. d.
Stamping - - - - per oz.		1 -	Stamping - - - - per oz.		2
Assay - - - - each		1 -	Assay - - - - each		3

Foreign Plate.—The same as above.

The Act 6 & 7 Will. 4, c. 69 (1836), authorised the Incorporation of Goldsmiths of Edinburgh to conduct the Assay Office and collect the Government duties at certain rates, but this was for some years done at an annual loss to the Incorporation, and the Assay Office would have been given up, so far as the Incorporation is concerned, on the abolition of the duties on gold and silver plate, had the above-mentioned rates charged for assaying not been, by arrangement with the trade, fixed at such a scale as covers the expense of the office.

GLASGOW.

GOLD.				s.	d.	SILVER.				s.	d.
Wares	-	-	per oz.	1	-	Wares, weighing 5 dwts. each and upwards	-	-	per oz.	-	1
Watch cases	-	-	- each	1	-						
Badges or medals not weighing more than 3 dwts. each	-	-	per doz.	-	6	Wares, under 5 dwts. each	-	-	per doz.	-	6
Studs, or links, or rings	-	-	"	-	6						

Fractions of a penny in the accounts to be charged one penny.

No parcel of gold will be charged less than one shilling, or parcel of silver less than sixpence, each parcel being one quality.

The charges for assays to members, for gold, one shilling; for silver, threepence. Non-members, gold, one shilling and sixpence; silver, sixpence.

The charges for imported gold and silver plate are the same as those for British or home manufactured plate.

The statutory authorities for making charges are 59 Geo. III., c. 28, and 6 & 7 Will. IV., c. 69.

DUBLIN.

GOLD.				s.	d.	SILVER.				s.	d.
For each wedding ring under 6 dwts.	-	-	-	-	1	Plate	-	-	per oz.	-	1
" fancy ring	-	-	-	-	2	Wares (not plate) weighing under 3 dwts.	-	-	- each	-	$\frac{1}{2}$
" medal or badge	-	-	-	-	4	Under 30 articles extra for assaying	-	-	-	-	4
" pair of sleeve links	-	-	-	-	4	Wares under 6 dwts.	-	-	- each	-	1
" bracelet	-	-	-	-	6	Under 12 articles extra for assaying	-	-	-	-	4
" chain	-	-	-	-	1	Medals or badges over 6 dwts.	-	-	-	-	2
" watch case	-	-	-	-	8	Watch cases	-	-	- each	-	6
Plate	-	-	per oz.	-	6	Lowest charge for silver	-	-	-	-	6

1s. is charged in all cases for assaying above the marking.

These charges are regulated by the Goldsmiths' Corporation of Dublin. There appears to be no statutory authority for making them, but the wardens have always looked to the Charter granted to the goldsmiths of Ireland by Charles II.

HALL-MARKING (GOLD AND SILVER PLATE).

RETURN of the CHARGES made for the Assay and MARKING of GOLD and SILVER WARES by the Hall-Marking Authorities in the undermentioned places, with respect to Plate manufactured in the *United Kingdom*, and to that Imported from Abroad, and the Statutory Authorities for making such Charges: London, Birmingham, Sheffield, Chester, Edinburgh, Glasgow, and Dublin.

(*Mr. Jesse Collings.*)

*Ordered, by The House of Commons, to be Printed,
5 December 1893.*

[*Price 1½ d.*]

456.

Under 2 oz.

REPORT

OF A

COMMITTEE APPOINTED BY THE SECRETARY OF STATE

TO INQUIRE INTO THE

BEST MEANS AVAILABLE FOR IDENTIFYING
HABITUAL CRIMINALS;

WITH

MINUTES OF EVIDENCE AND APPENDICES.

Presented to both Houses of Parliament by Command of Her Majesty.



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1894,

CONTENTS.

	Page
WARRANT OF APPOINTMENT - - - - -	4
REPORT - - - - -	5
The Methods of identifying Habitual Criminals now in use in England :—	
<i>The Habitual Criminals Registry</i> - - - - -	6
<i>Identification by the Metropolitan Police</i> - - - - -	8
<i>Identification by County and Borough Police</i> - - - - -	11
Inadequacy of the existing Methods of Identification :—	
<i>Mistakes in Identification</i> - - - - -	13
<i>Failures to identify old offenders</i> - - - - -	15
<i>Labour involved in the present system</i> - - - - -	18
The Bertillon System of Identification - - - - -	19
The Finger Print System of Identification - - - - -	25
Answers to the special questions put in the warrant of appointment :—	
I.— <i>Can the Bertillon system or the Finger-print system be adopted with advantage in England?</i> - - - - -	28
II.— <i>Should any new method proposed be in substitution for the existing methods or supplementary thereto?</i> - - - - -	30
III.— <i>What means should be adopted for putting in practice any new method of identification recommended?</i> - - - - -	31
IV.— <i>What rules should be made under section 8 of the Penal Servitude Act, 1891?</i> - - - - -	35
LIST OF WITNESSES EXAMINED - - - - -	37
MINUTES OF EVIDENCE - - - - -	38
APPENDIX A. :—	
1. Circular of 6th November 1893, and abstract of replies thereto - - - - -	68
2. Circular of 13th November 1893, and abstract of replies thereto - - - - -	70
APPENDIX B.—Table showing the proportion of the prisoners tried in London and in certain counties and boroughs in respect of whom previous convictions were entered in the Prison Calendars - - - - -	72
APPENDIX C.—Specimen Route-form - - - - -	73
APPENDIX D.—Note on the adoption of the Bertillon method in foreign countries - - - - -	74
APPENDIX E.—Instructions for taking the measurements of prisoners, and for noting their distinctive marks - - - - -	76
APPENDIX F.—Instructions for taking finger-prints - - - - -	79
APPENDIX G.—Memorandum as to the reading of finger-print formulæ - - - - -	80
APPENDIX H.—Account of a mechanical contrivance invented by Mr. Francis Galton to check the sorting of the cards in the Bertillon cabinet - - - - -	81

WARRANT APPOINTING THE COMMITTEE.

I HEREBY nominate and appoint—

CHARLES EDWARD TROUP, Esquire, of the Home Office ;

MAJOR ARTHUR GRIFFITHS, Inspector of Prisons ;

and

MELVILLE LESLIE MACNAGHTEN, Esquire, Chief Constable in the Metropolitan Police Force ;

as a Committee to inquire (*a*) into the method of registering and identifying habitual criminals now in use in England ; (*b*) into the “ Anthropometric ” system of classified registration and identification in use in France and other countries ; (*c*) into the suggested system of identification by means of a record of finger marks : to report to me whether the anthropometric system or the finger-mark system can with advantage be adopted in England either in substitution for or to supplement the existing methods, and if so, what arrangements should be adopted for putting them into practice, and what rules should be made under section 8 of the Penal Servitude Act, 1891, for the photographing and measuring of prisoners.

I further appoint the said Charles Edward Troup, Esquire, to be Chairman, and Harry Butler Simpson, Esquire, of the Home Office, to be Secretary of the said Committee.

Given at Whitehall, this twenty-first day of October, 1893.

H. H. ASQUITH.

R E P O R T

TO THE

RIGHT HONOURABLE H. H. ASQUITH, Q.C., M.P., PRINCIPAL
SECRETARY OF STATE, HOME DEPARTMENT.

SIR,

In this Report, which we have the honour of laying before you in accordance with the Commission issued to us on 21st October last, we think it will be convenient to follow the order of the several heads given in the terms of reference. We shall, in the first instance, state the results of our inquiries into the methods of identifying Habitual Criminals now in use in England, into the Bertillon system as practised in France and into the method of identification by finger-prints suggested by Mr. Francis Galton. We shall then proceed to make a recommendation as to the system which may, we think, most advantageously be adopted in England—the system we propose to recommend being one which borrows M. Bertillon's admirable method of classification, and at the same time embodies the practical results of Mr. Galton's investigations—and we shall conclude by suggesting in detail the arrangements to be followed and the rules to be made in the event of our recommendation being adopted by you.

THE METHODS OF IDENTIFYING HABITUAL CRIMINALS NOW IN USE IN ENGLAND.

For the purpose of making ourselves thoroughly acquainted with the manner in which the different Police Forces of this country put in practice the means at present available for the identification of Habitual Criminals, we have issued two circulars, copies of which, with an abstract of the replies, are given in Appendix A., and we have conferred personally with the Chief Constables and the heads of the detective forces of various counties and boroughs, some of whom attended to give evidence at the Home Office, while others we met on our visits to Wakefield, Leeds, Bradford and Birmingham. We have also visited the Convict Supervision Branch at New Scotland Yard and the Habitual Criminals Registry in the Home Office, and have minutely examined the registers, records and volumes of photographs there in use. From the officers of these two departments, from the Prison Commissioners and from the Governors and officers of the Prisons of Holloway, Pentonville, Wakefield, Leeds and Birmingham, we have from time to time obtained much useful information. Most of the evidence we have obtained was taken informally, and a large part had immediate reference to books, forms, documents and photographs. Only a small portion, therefore, of the oral evidence has been put in writing, and will be found in the Minutes.

It may at the outset be stated in general terms that the practice of the English police, though the details differ widely in different forces, is always dependent on personal recognition by police or prison officers. This is the means by which identity is *proved* in criminal courts; and, though its scope is extended by photography, and it is in some cases aided by such devices as the registers of distinctive marks, it also remains universally the basis of the methods by which identity is *discovered*.

A personal knowledge of habitual offenders is obtained primarily in connexion with their arrest and trial for their earlier offences; but further facilities for acquiring it are supplied by the conditions which require licensed convicts and persons under sentence of police supervision to report to the police once every month, and also on every change of residence. The personal interviews thus rendered necessary afford the police excellent opportunities of acquiring a good knowledge of the more dangerous of the criminals with whom they have to deal; and the faculty of recognising and remembering faces, which is so useful in all departments of a police constable's work, is by this means encouraged and developed to a very high degree.

Generally speaking, therefore, when an habitual criminal resident in a particular district is arrested in that district on a criminal charge, his antecedent history will be within the knowledge of the local police; and it is rare for such a man, when once he finds himself known, to dispute the evidence of his identity or attempt to repudiate the record of his previous misdeeds. The greater part of the crime in this country is committed by criminals of this class—by men who are well known to the police of their district, whether it be a borough or a division of a county, and who have little chance, unless the circumstances be exceptional, of disguising their identity.

On the other hand, the offences committed by men travelling from county to county or conducting operations in one police district while habitually residing in another are not inconsiderable in number, and are often of a peculiarly serious and dangerous character. If a distinction be made between a "professional" criminal—the man who has deliberately adopted a career of dishonesty or violence as a means of obtaining a livelihood—and the man who only lapses into crime occasionally and, as it may be said, under stress of circumstance, it is clear that the travelling thief or burglar belongs almost always to the former rather than the latter category. To the former class also belong, as a rule, those criminals who, without being regular travellers, move from a district where they have become well known to the police to another in which they hope to be rid of their past history and to begin with a clean record a new career of crime. The answers received to our circular of 13th November (p. 70) illustrate the proportion between local crime and crime committed by "foreigners" in the different parts of the country: and, though no exact statistics can be given, we think it may be taken as certain that while in most districts the bulk of crime is local, a considerable proportion of the most serious offences are committed by those "foreign" criminals, whose antecedents it is at once most desirable and most difficult to trace.

Further, even with regard to local criminals, the difficulty of personal recognition becomes very great in the large centres of population. The number of criminals seen by each officer is so great that it is impossible after any considerable interval for any but a man endowed with a singularly good memory to remember more than a few of them; and unless the memory is aided by photographs and registers, mere personal recollection is insufficient to secure the identification of those persons who repeatedly come before the Courts. This is especially the case in London, where not only the criminal but the ordinary population is constantly moving from one district to another, and where an offender might be arrested in a dozen police divisions and convicted in a dozen different courts, without being seen twice by the same officer. Were it not for the assistance of the prison warders—all remand cases from London being concentrated in one large prison—and the special police arrangements to be described later, it would be impossible in London to secure the identification of more than a very small proportion of the local criminals.

The question, then, is what are the agencies by which "travelling" criminals throughout the country, and the local criminals of the Metropolis and of other large centres of population, can be so traced that, when arrested for a fresh crime, they may be confronted with the police officer or the prison warder, who is able to prove their identity and to establish their past record.

The Habitual Criminals Registry.

The Habitual Criminals Register is the only agency specially established by Parliament and intended for general use throughout the country in the work of identifying old offenders. It was first established under the Habitual Criminals Act, 1869, which was repealed and partially re-enacted by the Prevention of Crimes Act, 1871. The latter Act now provides (section 6) that "Registers of all persons convicted of crime . . . shall be kept in such form and containing such particulars as may from time to time be prescribed . . . by the Secretary of State . . . The register for England shall be kept in London, under the management of the Commissioner of Police of the Metropolis, or such other person as the Secretary of State shall appoint." At first the register included all persons *convicted of crime*: crime being defined by section 20 as including any felony and the following misdemeanours:—the uttering of false or counterfeit coin, the possession of counterfeit gold or silver coin, the obtaining of goods or money by false pretences, conspiracy to defraud and the offence of being found by night in possession of housebreaking instruments. It was soon found, however, that the registration of criminals was being carried out on far too large a scale, and that the results attained were altogether disproportionate to the labour involved—a large part of the persons registered not being habitual criminals in any ordinary sense of the term—many of them first offenders, and some children convicted of trivial thefts. The Prevention of Crimes Amendment Act, 1876, was therefore passed, and power given to the Secretary of State to determine what classes of prisoners should be registered; and by Lord Cross's regulations of 15th March 1877, the register was confined to "every person convicted on indictment of a crime, a previous conviction of a crime being proved against him." This is the class to which sections 7 and 8 of the Prevention of Crimes Act, 1871, are applicable; and it appears to us to be the best legal definition of "Habitual Criminal" which it is possible to obtain. The register, which had at first been established at Scotland Yard under the charge of the Commissioner of Metropolitan Police, was now transferred to the Home

Office, and Sir Edmund Du Cane, the Chairman of the Directors of Convict Prisons, was appointed Registrar.

At the present time the work of this Register is carried on, under the direction of Sir Edmund Du Cane, by Mr. Grace, who is also keeper of the register of convicts—a register maintained chiefly for the purposes of prison administration—and who has two assistants, one for each branch of his work. It is still controlled by the regulations of 15th March, 1877, except that, in addition to the habitual criminals, as above defined, the names of all convicts released under sentences of penal servitude are included. The register is prepared from a return which is made from convict and local prisons a few days before the discharge of every convict and of every habitual criminal. This return (commonly known as “Form R”) contains a statement of the prisoner’s convictions, his personal description, the full particulars of his distinctive bodily marks and his photograph. The total number of these returns received last year was 3,851; it has been annually decreasing since 1884, when the number was 5,210. From these returns two volumes are annually compiled:—

(I.) *The Habitual Criminals Register*, containing all the names in alphabetical order, and giving, in columns opposite to each name, the prisoner’s full description at the time of his discharge including his distinctive marks, the particulars of his last conviction, his destination on discharge and the number of his previous convictions, with references to entries in previous registers. The register is published annually and contains all habitual criminals and convicts who have been liberated between 1st January and 31st December of the previous year.

(II.) *The Register of Distinctive Marks*, in which cases are classified by the position of the marks on the body. It falls into nine main divisions according as the marks are on (1) the head and face, (2) the throat and neck, (3), the chest, (4) the belly and groin, (5) the back and loins, (6) the arms, (7), the hands and fingers, (8) the thighs and legs, (9) the feet and ankles. These are again sub-divided: *e.g.*, under the head “arms” we have “loss of arms,” “tattoo marks,” “distortion from fracture or dislocation,” “loss of power,” “scars from wounds or burns.” The purpose of this register is to enable a criminal to be traced by means of his distinctive marks. If, for example, a prisoner is found with a burn on the right upper arm, the register is searched in the division “arm, right,” under the head “scars from burns.” Under this head will be found a list of all convicts and habitual criminals discharged during the year having a burn on the upper arm, with further descriptions, such as “inside” or “large,” or indications of other marks such as “burn on side,” “burn above knee”; and by means of these indications it is supposed that the particular case can be identified, reference being made, in cases where more than one person is entered as having the same distinctive marks, to the fuller descriptions contained in the Alphabetical Register. The Register of Distinctive Marks is published annually at the same time with, or soon after, the alphabetical register, and the Registers of Distinctive Marks for each period of five preceding years are also tabulated in one volume and published.

Copies of both registers are distributed to all police forces. The evidence we have received as to their use conveys an impression that even those police forces who frequently consult them do not by this means make a large number of identifications. An abstract of the opinions we have obtained will be found in the Appendix, p. 68. The statement of the Chief Constable of Newcastle-on-Tyne that they are frequently examined, and occasionally with success, may be taken as typical of the verdict of the majority of the police authorities. In some districts, such as the North Riding of Yorkshire, the borough of Leeds and the Metropolitan Police District, they are very rarely or never referred to, and on the other hand Liverpool is the only force of those we have consulted that reports many identifications actually effected thereby.

The information we have obtained as to the number of inquiries received in the Registry from the police seems likewise to show that these volumes are not very extensively used. During the months of August, September and October last sixty-one inquiries were thus made; in twenty instances no information could be given; in forty-one the original returns from the prisons, with the photographs attached, were forwarded to aid in the identification of the suspected persons. In twenty-three of these cases the identification was correct, in eight incorrect, while in the remainder no intelligence had reached the Registrar of the result of the information supplied.

We think it a matter for regret that this Register has not been more generally used by the police. It was the first attempt made in England or elsewhere to form a classified register of criminals in which they could be traced by their personal description and independently of the names they might assume; and it has the advantage of being prepared in a form which can be circulated and used by each police force for

itself. The work of preparing the register has, we are satisfied, been carried out with great care and accuracy.

The drawbacks which have led to its comparative failure appear to us to be :—

(i.) That many persons have no bodily marks that are really *distinctive*. Some have no marks sufficiently permanent and definite for the purpose in view, as in a case mentioned by Mr. Grace where a minute red spot under the eye was the only “distinctive mark” given. A much larger number have marks which, though definite in themselves, are shared by a great number of other convicts. For instance, in the Register for 1892, in the division “Left Hand,” under the head “tattoo marks,” no fewer than twenty-eight persons are entered as having a ring on the second finger, and in only three of these cases is a second distinctive mark added; if therefore a person is arrested having a tattoo ring on the second finger of the left hand at least twenty-five cases in that volume alone would have to be examined, besides a much larger number of other cases with the same distinctive mark in previous volumes. It is true that this difficulty could to a large extent be overcome by more minute descriptions and by measuring the position and size of the marks, but this would involve a complexity of entries which would make an Index Register almost unmanageable.

(ii.) That the published registers are for one year only, and that no volume, therefore, contains a complete list of habitual criminals. The same case reappears in successive volumes only in the case of repeated convictions. If an habitual criminal has escaped detection for several years, his name will only be found in the year on which he was last released from custody. In the case of the Register of Distinctive Marks this difficulty is partly met by publishing quinquennially a volume covering a period of five years.

(iii.) That the registers for each year are not published until late in the following year. The Alphabetical Register of criminals discharged from prison in 1890 was not issued till 7th October 1891; that for 1891 not till 25th July 1892; and that for 1892 not till 9th of September of this year. The Distinctive Marks Register for 1890 was not issued till 9th December 1891; that for 1891 not till 23rd November 1892; and that for 1892 not till 9th September 1893.* An habitual criminal's name is, therefore, not available for the police in the registers until a period of from 9 to 20 months after his release, though this is precisely the time during which he is most likely to be wanted. A large number of the persons whose names are contained in the register must, before the date of its publication, be again convicted, and either escape identification or be identified by some other means.

The fact that scarcely any of the police authorities whom we have consulted have complained of the lateness of publication is of some significance. If the police generally found the registers of essential value in their work, they would be anxious to have copies for use much earlier than at present.

It appears to us, therefore, that the comparative failure of these registers is due, not to any want of care in the way in which the work has been done, nor to the mode of classification, but rather to the inherent difficulty of devising any exhaustive classification of criminals on the basis of bodily marks alone, and also to the difficulty of using a register of criminals that is published at intervals and in a printed form. We do not, however, think that the police have made all the use of this register which they might have done; and had no other means of classifying criminals been available, we should have been ready to recommend that this register should be improved by (1) a reduction of the number of cases included, (2) by a more definite description of the bodily marks, and (3) by publication at shorter intervals, and possibly also by the introduction of a card index, which could always be kept up to date. As will appear, however, from the later part of our report, we consider that a better principle of classification may now be adopted, and in view of its introduction any extensive alteration in the Register of Habitual Criminals is, it appears to us, unnecessary. Even in its present form, however, it is of some use to the police, and, probably, of more use in prisons,—we had evidence, for instance, of its frequent use in Pentonville; and we are satisfied that it ought not to be discontinued until a better system is not merely decided on, but is in full working order.

Identification by the Metropolitan Police.

While the Habitual Criminals Registry is the only means provided by the central government for the identification of criminals, greater importance in practice attaches to the agencies which have been organised for this purpose by the police themselves. In an account of these agencies, the first place is to be given to the Metropolitan Police.

* The issue of the registers in 1891 was delayed beyond the usual time by the transfer of the Prison printing establishment from Chatham to Parkhurst.

partly because they are an imperial as well as a local Police Force, having duties beyond the area under their immediate control, but chiefly because within that area the problem of identification is far more difficult and complex, and the means of solving it more highly organised than elsewhere. The local jurisdiction of the Metropolitan Police extends over an area that is more than twenty times as large, and over a population that is more than ten times as large, as that of any other urban police district. Moreover, as the seat of Government, the commercial and financial capital of the empire, and the centre of wealth and luxury, London presents peculiar attractions for the professional criminal. Not only is the local knowledge, on which all police forces must so largely rely, less easy to accumulate than either in a county where the population is comparatively sparse, or in a borough whose area is comparatively small; but the character of the criminal population is somewhat different from what is found elsewhere, and the police have to contend with difficulties which are unknown, or known only on exceptional occasions, to county and borough forces. As, for one week in the year, Doncaster Races, Hull Fair, and Birmingham Cattle Show afford to swindlers and pickpockets from all parts of the country a special opportunity for reaping a harvest, so at all times London offers to the able and energetic criminal an exceptionally favourable field for his operations. It is probable that all the most dangerous criminals in the country, who are not themselves Londoners, visit London for purposes of crime at some stage or other in their career, and London is the chief if not the only resort in England for the most bold and cunning criminals of foreign countries. It is also the residence and place of refuge of most of the travelling burglars and pickpockets who make excursions to the counties and country towns, and of some who extend their operations to the Continent. Its importance as a centre for the criminal classes is illustrated by the fact that the majority of convicts take their discharge in London: in 1891 out of 1,024 convicts 696 were discharged into the Metropolitan Police District, and in 1892 871 out of a total of 1353, although these figures must be taken with the qualification that the number of convicts who remove from London during the currency of their licences is greater than the number who report themselves to the police as coming from other districts to reside there.

The work of identifying criminals in the Metropolitan Police District is managed by the Convict Supervision Office, a department originally formed to deal with convicts and others under sentence of police supervision, but which has now far outgrown its original functions, and, under the direction of Chief Inspector Neame, deals with the whole of the records of crime and all habitual criminals. This Office receives from the Divisions a report of every conviction of crime in the Metropolis with a personal description of the offender, and in the case of convicts and of persons under sentence of police supervision ("8th section men") about to be discharged from prison, a much fuller description, accompanied by photographs, is forwarded to them by the Governor. Photographs are also obtained from the prisons of a large number of other criminals who are not under supervision—most, but not all of them, "7th section men." From these materials, which are carefully numbered and filed, various registers are formed:—

1. There are Alphabetical Registers of the names of convicted criminals.
2. There are albums of photographs of all convicts, and since 1887 of a large number of other habitual criminals. In the earlier volumes the photographs are arranged chronologically as they were received; but those of later date are sub-divided according to the age and stature of the persons, and according to the class of crime that each criminal affects.
3. A very elaborate Register of Distinctive Marks is now kept, and this being in manuscript can be kept constantly up to date, and is in a more convenient form for use than the printed Habitual Criminals Register, the use of which it entirely supersedes. The general division of the book is by the parts of the body, and is similar to that of the Habitual Criminals Register; but the sub-divisions are by parallel columns on the same page as in the example given in the footnote below.* In this way

* SPECIMEN of the FORM of the DISTINCTIVE MARKS REGISTER kept in the CONVICT SUPERVISION OFFICE.

RIGHT ARM.

Name.	No.	Limb deficient, malformed, injured, or diseased.	Tattoo Marks.					Moles or Warts.	Other Marks.
			Anchor or Cross.	Man or Woman.	Ship or Flag.	Heart or Star.	Other Marks.		

entries of several marks can be made simultaneously, and in consulting the register, the eye running down the columns can very quickly pick out cases having the particular marks sought for. It was, however, strongly represented to us by Chief Inspector Neame and his officers that there should be greater precision in the taking of descriptive marks, and that their distance from fixed points in the body should be measured and recorded.

Supplementary to this volume there is an Alphabetical Register of Tattoo Initials and Names, and it is extraordinary how large a number of habitual criminals provide the police with an easy means of identifying them by names or initials tattooed on their bodies. There are also classified lists of criminals addicted to particular varieties of crimes, such as coining, stealing bicycles, larceny from lodgings, or swindling by means of an employment agency.

When any person is arrested in the Metropolis and charged with crime, whose antecedents are unknown, but who is suspected of being an old offender, an inquiry on what is called a "Search Form," with a description of the accused, is at once sent to the Convict Supervision Branch, and the officers of that branch endeavour, if possible, to trace the case by their registers. If the accused is brought before a magistrate and remanded, the officer in the case himself attends at the office to aid in the search and particularly to examine the volumes of photographs. When the previous convictions of a prisoner are known, the particulars are sent, with the search form, to the Convict Office, but the officer himself does not attend.

A large number of inquiries are received from County and Borough police forces, and some from abroad, in pursuance of which search is always made, not unfrequently with success. Details as to the mode in which the search is made will be found in Chief Inspector Neame's evidence, page 38, and a paper handed in by him, and printed on page 39, gives statistics of the amount of work and of the results.

In other ways the Convict Supervision Office aids in the general work of identifying criminals. The descriptions of persons in custody given in the daily "informations" issued to all Metropolitan Police Stations sometimes lead to recognitions, and the "Police Gazette," which is published twice a week, contains descriptions and occasionally portraits of persons in custody who are supposed to be concealing their identity or to be wanted, as well as of convicts on licence or under supervision who fail to report and whose arrest is required, and in the country as well as in London identifications are sometimes made by this means.

In the case of a considerable number of habitual criminals, photographs are not merely kept at Scotland Yard, but are also sent to the divisions, and albums of photographs are kept at the divisional stations. Three times a year the Office also issues to other police forces as well as to the divisions a circular with photographs of the more eminent criminals known by the Metropolitan Police to be at large. This circular appears to be of very great service to forces in the South of England. In the North, however, few of the forces subscribe to it, and it is said that the criminals included in it are not often to be found extending their operations to the northern counties. Several police forces have strongly urged that this circular should be issued more frequently.

The work of the Convict Supervision Office does not, however, exhaust the means by which the Metropolitan Police secure the identification of criminals. The most characteristic and, as it would appear, the most effective method is the inspection of remand prisoners in Holloway. To this prison are sent all persons committed for trial or remanded by magistrates within the Metropolitan Police District, and here, three times a week, come warders from the gaols at Wormwood Scrubs, Pentonville, Wandsworth and Chelmsford, and detective officers from the twenty-two Metropolitan Police Divisions, an inspector from New Scotland Yard, and six officers from the City of London Police, to view the unconvicted prisoners at the hour of exercise. In this way a prisoner, whose identity is unknown to the constable by whom he has been arrested, will often be recognised either by a warder who has known him in prison, or by a police constable who has had him in custody on some previous charge. The following figures will show of what value this practice is for the purpose of identifying old offenders.

**PRISONERS IDENTIFIED in HOLLOWAY by CRIMINAL INVESTIGATION OFFICERS and WARDERS
as having been previously CONVICTED.**

Year.	Identifications.	By Warders.	By Police.
1883	1,826	1,427	399
1884	1,986	1,730	256
1885	2,081	1,834	247
1886	1,913	1,727	186
1887	1,594	1,367	227
1888	1,711	1,495	216
1889	1,462	1,188	274
1890	1,797	1,553	244
1891	1,671	1,485	186
1892	1,964	1,765	199
1893	1,949	1,759	190

It should be explained with reference to these figures that the warders see the prisoners before the police officers and that all the identifications which are made both by warders and by police officers are put down to the credit of the former.

It will be clear that this method is merely a specially organized form of the personal recognition which is the basis of the whole of the English system, but so much importance is attached to it by the Metropolitan Police that it seems to deserve very special consideration.

Identification by County and Borough Police.

Turning now to the local police forces, we find that most, if not all of them, endeavour to aid the work of personal recognition by keeping registers and photographs of the prisoners who pass through their hands, and in some of the larger and better organized forces special registers of other kinds are also kept. At Birmingham there is a register which shows, by means of coloured drawings, the tattoo marks with which so many criminals ornament their bodies, and some very remarkable though isolated instances have occurred of recognition by this means. Again, at Liverpool special registers are kept of the maiden names of the wives and mothers of criminals, as it is found that in a large proportion of cases an offender, when he changes his name, takes either his wife's or his mother's. In no case, however, of which we are aware, does any force attempt to maintain such an elaborately classified register of descriptions as that kept at Scotland Yard, and where offenders are traced by an index of personal descriptions, it is, as at Liverpool, the Habitual Criminals Register that is used for the purpose.

Nor is there among provincial police anything corresponding to the regular inspection of remand prisoners at Holloway. In some cases where two or three prisons are near one another (like Wakefield and Leeds), warders from one prison will visit the others, for the purpose of making identifications; and it is stated that at Liverpool prisoners from the county and from neighbouring boroughs are brought to the city Bridewell if it is thought that the Liverpool Police might be able to recognise them. We think, however, that great advantage would ensue if the prison at every large centre of population were regularly visited by detectives from the neighbouring police forces, so that there might be an opportunity of prisoners arrested in one district being identified by officers from the adjacent districts. Thus at Birmingham it would probably lead to a good many identifications not otherwise obtainable, if detective officers from Birmingham, Staffordshire and Warwickshire were to make periodical visits to the prison, and we understand that the Prison Commissioners have always been anxious to afford facilities for this purpose.

There seems, however, to be an almost complete agreement in the opinion that the method most generally used by the county and borough police, and used with the best

results, is the "route form." The route form (of which a specimen will be found in the Appendix, page 73) gives the photograph, if it can be obtained, and a written description of a prisoner charged with some criminal offence, concerning whose antecedents it is desired to obtain information; while below the description are noted the names of five or six police or prison authorities that are considered most likely to have had the man in custody. This is the "route," and the paper passes from one authority to another, being examined at each place by as many as possible of the detective officers or warders, and each authority notes on the paper any information they possess, as to the previous convictions of the accused, or the words "not known" if they possess no information. The last authority named in the route then returns it to the place whence it was issued, the route being as a rule so arranged as to secure its return within a week, the usual time for a remand.

These forms are very commonly issued by the police during the interval of a remand, or, if the prisoner be committed for trial, during the time he is awaiting trial, and are addressed to the police of districts from which he may be suspected to come, and more especially to the police of the Metropolis, to the governors of prisons and to the Habitual Criminals Registry. Sometimes only one route is issued, sometimes several are sent out simultaneously, occasionally in an important case route forms are spread broadcast to almost every police force in the country. Routes are also issued by prison governors in the case of prisoners committed to their custody to await trial, and even sometimes in the case of convicted persons whom there is reason to suspect of being old offenders unknown to the police by whom they were charged. They are, of course, used only for the purpose of *tracing*, never for the purpose of *proving* identity, and to verify an identification suggested by this means, the attendance of a constable or warder is always necessary. But they afford the most remarkable instance of the way in which the facilities for personal recognition are increased by the use of photography.

The improvement in the present system which has been most urged on us by all the police witnesses whose evidence we have taken, has been that greater facilities should be given for obtaining photographs of untried prisoners with a view to issuing more route forms. At one time such photographs were regularly taken in many county prisons, but the practice was discontinued in consequence of doubts as to the power to compel remand prisoners to be photographed; they are now taken only in exceptional cases, and a prisoner who refuses to be photographed is not subjected to restraint or punishment. Many police forces, however, are able, either with their consent, or without their knowledge, to obtain photographs of all prisoners strongly suspected of being old offenders; and it is these photographs circulated in the route forms that in the great majority of instances lead to the identifications, the route form without a photograph being rarely or never of any use. Under the Penal Servitude Act, 1891, the Secretary of State has power to provide by rule for the photographing of untried prisoners, and we are strongly of opinion that a rule for this purpose should be made under safeguards which we shall suggest hereafter. It will, indeed, be necessary for the carrying out of the system of identification which we propose to recommend, and apart from that it would be of immense use in making the existing methods of identification more efficient.

In recommending an increase of the number of photographs taken, we must not be understood as recommending an indiscriminate increase in the number of route forms, and indeed we are confident that the system we are about to recommend will, when fully established, lead to a great reduction. It is to be remembered that each route issued involves a large total amount of labour though it is spread over many persons, and their indefinite multiplication would be a great evil. They are hardly used at all by the Metropolitan Police; only in one or two special instances, where a judge has ordered a case to stand over to an ensuing sessions for the purpose, have untried prisoners been photographed and "routed." If the Metropolitan Police were to issue them as some borough forces do, police officers and prisons would be overwhelmed with the number which they would receive. Even as it is we have received complaints, particularly from Liverpool, of the great waste of time involved in examining route forms indiscriminately sent them by certain forces.

INADEQUACY OF THE EXISTING METHODS OF IDENTIFICATION.

We are next to consider whether any necessity exists for a radical change in the methods of identification of which we have given a brief account above.

The necessity for such a change, if the necessity exists, might be assignable to three causes: that is to say, good ground for change would be established if it were

shown either (i.) that under the present system it is possible for a prisoner to suffer undeservedly through a mistake of identification; or (ii.) that a considerable proportion of old offenders are successful in concealing their identity when arrested for a fresh breach of the law; or (iii.) that, even if they are identified, the process of identification is more slow and cumbersome than necessary.

(i.) *Mistakes in Identification.*

If the first contingency were found to be probable, it would, as Sir Richard Webster has urged in his evidence, supply by far the strongest argument for a change of system. On this point it is not easy to obtain positive evidence. In any system which depends, as the English system does, on personal recognition, there must be some possibility of error arising from defective or confused memory on the part of the warder or constable who undertakes to say that a prisoner is the same man whom he had in custody for another offence some months or some years before; but, on a careful consideration of the evidence available, the safeguards in the existing system appear to us to have been sufficient either to prevent such errors or to secure their correction in time. With one possible exception (Callan's case mentioned below), no instance of any prisoner having actually undergone additional imprisonment through a previous conviction being erroneously imputed to him has been brought to our notice. In the Home Office records which we have carefully examined, we have found a certain number of cases in which prisoners have, in the first instance, been credited with offences of which they had never been convicted. These mistakes, however, seem to be rare; they are due to a faulty memory on the part of some constable or warder or to some want of proper care, and in every case they have been corrected before the prisoner suffered actual prejudice. In none of them has there been any serious difficulty in ascertaining the truth on inquiry through the means afforded by the existing system, and we do not think there is any ground for fearing that there are at present any persons suffering in consequence of a mistake of this kind. If there were, it is certain that they would complain both in petitions to the Secretary of State and by word of mouth to the Inspectors in their visits to the prisons, but it is the fact that among the thousands of petitions which are received from persons who profess to consider themselves unjustly convicted or too severely punished, it is rare to receive any representation that a previous conviction has been wrongly attributed to the prisoner, and equally rare for an Inspector to have such complaint made to him. When any such complaint is made, conclusive evidence to settle the question of identity can usually be obtained without much difficulty. On this point Mr. Murdoch's evidence (page 63) only confirms the opinion to which our own inquiries have led us.

It may make this matter clearer, however, if we give particulars of the most striking cases of mistaken identity that we have been able to discover; but to prevent misapprehension we should first point out that nine-tenths of the cases of "mistaken identity," commonly so-called, fall altogether outside the scope of our inquiry. We are merely concerned with the machinery by which habitual criminals, when charged with a fresh offence, may be recognized. If a witness is mistaken in believing that a prisoner is the individual who was seen on a certain day to do a certain act, such a mistake is not one that can be prevented by the French method or by any other imaginable method of identification. The cases we are about to mention are all of recent date: older ones could be found but they are of less importance for the present purpose because they occurred before the existing safeguards against mis-identification were established. We also omit certain cases where a prisoner has acquiesced in an erroneous identification, knowing his own previous record to be worse than that of the man for whom he was mistaken.

The first case we have noted as bearing on our inquiry is that of a man named James Coyle, who was convicted at the Clerkenwell Sessions on the 4th June 1889, of larceny from the person. A warder from Millbank swore to his having been previously convicted under the name of Hart in 1879. The prisoner denied this in court; and, though the jury after having seen Hart's photograph and description gave a verdict in accordance with the warder's evidence, sentence was postponed and further inquiry made. It was then found that the distinctive marks ascribed to Hart did not tally in all respects with the prisoner's, and that Coyle had been, as he alleged, serving a short sentence at Lewes at the time when Hart was in penal servitude.

Coyle, when brought before the police magistrate as Hart, had not denied the identification, reserving his defence till the trial. There can be no doubt that if it had not been supposed that on being charged he admitted the identification a sufficient

number of warders and others who were well acquainted with Hart would have been confronted with the prisoner before the trial, and there is no reason to think that they would have made the mistake that was made by the one warder called as a witness.

The second case is that of a woman giving the name of Eliza Witchurch, who was convicted at Gloucester on the 23rd November 1891, of burglary. She had been arrested by the County Police six days before, and as she was not known, descriptions of her had been sent to the Police Gazette, the Metropolitan Police, and other forces. From information received from the police at Ilminster it was thought that she was a woman who had been convicted of stealing at Southampton in December 1889, under the name of Elizabeth Smith, and of burglary at Poole in October 1890, under the name of Elizabeth Clode. She repudiated neither of these convictions, and the latter was formally proved in court by a police officer from Poole. But from other information received from Scotland Yard, Gloucester and Newport, she was thought to be also one Eliza Rolfe, against whom no less than eight previous convictions for larceny and other similar offences were recorded. The photographs and descriptions of the two women corresponded pretty closely, especially in the particular that both had lost the left breast; and, though the shortness of the interval between arrest and trial left no time for the identification to be verified by witnesses personally acquainted with Rolfe, the prisoner was credited with Rolfe's convictions and they were entered in the list which the judge had before him when he passed sentence. After she was lodged in prison, while admitting the convictions in the names of Smith and Clode, she protested in a petition against the identification with Rolfe, and inquiry being made, it became clear that in fact she was not Rolfe. As the list of previous convictions had affected the amount of punishment awarded, the sentence was reduced at the request of the judge from seven years' penal servitude to six months' imprisonment.

In February 1892, a man giving the name of Henry Hodgson was charged before the Liverpool magistrates with "frequenting." The clothes that he was wearing showed that he had recently come out of a convict prison, and he was believed to have come from London. The police on searching the list of discharged convicts identified him with one Thomas Franklin, a licence-holder, whose photograph and description were found to correspond with the prisoner's. After his conviction and committal to Liverpool Prison, when the question of revoking his licence arose, the prisoner strongly denied being Franklin. The police, being so informed by the Governor, made further search, and seeing in the Police Gazette notice of one Peter Connor a licence-holder, obtained Connor's descriptive form from the Salford Police. On being confronted with this evidence, Hodgson admitted being Connor, who is an experienced and dangerous criminal, and who had been discharged on licence on the 19th January into the Metropolitan Police district and had notified his intention of going to Manchester. The prisoner therefore gained nothing by the correction of the mistake: in either case he was an habitual criminal and in either case a licence-holder whose licence was liable to revocation on account of his recent conviction.

Another case of mistaken identification has been referred to by Mr. Spearman in his evidence—that of David Callan or Callaghan, charged at Westminster Police Court on 6th May 1889, with begging from house to house in Wilton Crescent. A police constable positively identified him as one William Minson, who was convicted two years before of being drunk and disorderly and who had 11 convictions of begging and similar offences. At the police court an officer of the Mendicity Society proved these convictions, and a warder from Chelmsford Prison is also said to have attended to prove his identity but was not called. The prisoner was convicted under the Vagrancy Act as an incorrigible rogue—a conviction which depends on evidence of previous convictions—and was sent to the North London Sessions where he was sentenced to six months hard labour. In a petition to the Home Office he protested that at the time of the convictions attributed to him he was an inmate of St. George's Workhouse, Westminster. Inquiry at the workhouse showed the truth of his statement, and he was at once discharged from prison. In this case the mistaken identification led to a conviction which could not otherwise have taken place; but it is proper to add that Callaghan was subsequently convicted as an incorrigible rogue, and there is good reason for believing that in May 1889 the mistake was not the conviction itself, but the conviction under a wrong name.

The last case we shall cite is also in our opinion the one that might most naturally excite doubt as to the sufficiency of the existing safeguards against an erroneous identification. In the early morning of 4th May 1893, one Percy Albert Blake was found in a pawnbroker's shop in the Strand in circumstances which pointed strongly to a deliberately planned burglary: the prisoner gave a rambling and incoherent

account of himself, and it became evident that he was either a lunatic or a clever and dangerous burglar. The police constable who arrested him, on searching the collection of photographs at the Convict Supervision Office, believed that he could be identified with one Henry Steed, alias John Blake, who had been convicted of attempted burglary in July 1881, had failed to comply with the conditions of a sentence of police supervision then passed on him and had not since been heard of. Inquiry was made of persons who had known Steed, and they agreed that the present prisoner was the same man; and evidence to this effect was given at Bow Street by the police constable who had charge of the case against Steed in 1881, by another constable who was present at Steed's conviction, by a retired police constable who had also had to do with the case, and by a retired prison-warder who had seen Steed daily at Pentonville while he was serving the sentence of 18 months' imprisonment passed on him in consequence of the conviction in 1881. On the other hand, the description in the Convict Office of Steed stated that Steed's right leg showed signs of a fracture. At Bow Street a surgeon gave evidence that there were no signs of a fracture on either of P. A. Blake's legs, expressing the opinion however that all signs of a fracture may disappear in the course of time. There was also evidence given on the prisoner's behalf showing that he could not be the man who was convicted under the name of Steed in 1881. Blake was committed for trial on 25th May: the prosecution was undertaken by the Treasury and careful inquiries were at once made in various directions to test the truth of the statements made in his defence. As the result of these inquiries, evidence was obtained of Blake's having been at liberty at the time when Steed was undergoing the sentence passed on him in 1881; and at the trial on 29th June no evidence being offered for the prosecution, Blake was acquitted and he was afterwards sent to a lunatic asylum. Subsequent investigations left no doubt that Blake was entirely innocent of the previous convictions at first ascribed to him.

In this case the personal description of Steed was too vague to establish an identification even had there been no discrepancies, and too uncertain to prevent a misidentification when discrepancies occurred. The mistake arose either from a very strong resemblance between P. A. Blake and Steed, or from a very defective recollection on the part of no less than four persons, and it was only corrected by what may be described as evidence of an alibi—evidence which might not be available if a similar mistake were to occur in another case.

All these cases, and especially the last one, although in each of them the mistake was corrected in time, do undoubtedly suggest the possibility that another case of mistaken recognition might occur which the record of distinctive marks or the evidence of an alibi might be insufficient to correct. We cannot say that we have found any case in which the existing safeguards have failed to prevent a convicted prisoner suffering unmerited punishment; but we think it must be admitted that if a new method can be devised which would afford an absolute safeguard against such mistakes in the future, it would be a great gain to the administration of justice.

(ii.) *Failures to identify old Offenders.*

The second ground on which the existing system may be deemed insufficient is its failure to secure in every case, or in the majority of cases, the identification of old offenders; in other words, a new system may be required to afford a more perfect means of acquiring knowledge of each offender's antecedents.

And here we feel bound to mention an objection which we have heard several times in the course of our inquiry:—"Of what use is it," we have been asked by chief constables and others, "to elaborate a system whereby the previous convictions of a prisoner charged by the police may be accurately recorded and brought to the notice of his judge, if they are to be altogether overlooked by him in passing sentence? It is vain for us to exert ourselves to discover the history of offenders, if no difference is to be made between a hardened criminal and a first offender, or at any rate none between the man who has deliberately set himself to gain a living by crime, and one whose lapses are not the outcome of a settled design, but are merely occasional and due perhaps to momentary impulse." We have heard this objection repeatedly, but we confess it has not influenced our judgment as to the importance of securing accurate identifications. We are satisfied that most judges, recorders and chairmen of quarter sessions not only distinguish between first offenders and old criminals but are ready to make allowance even for a man who has more than once relapsed into crime, if his record does not show that he has adopted crime as a regular means of livelihood. If no record, or a defective record, were kept of a prisoner's previous convictions it would become impossible to make these distinctions—the average sentence might be

less, but the distinction in favour of the first offender or the occasional criminal could not be maintained. We are certain that the majority of judges and chairmen of quarter sessions would object, and rightly object, if the police made the occasional leniency shown to old offenders an excuse for relaxing their efforts to supply the court before sentence is passed with an accurate history of each prisoner's judicial antecedents, and that a failure on their part to carry out this duty would be detrimental to the fair administration of justice. On the other hand if any improvement can be made by which the antecedents of prisoners can be more easily and more accurately ascertained, it will be easier and safer for judges to discriminate in favour of the less criminal portion of the offenders on whom they have to pass sentence.

Indeed, we ourselves would venture to go further than this, and to look forward to a time when an even more marked distinction may be made between different classes of criminals. When experience has at last shown that on a certain class of criminals long sentences and short sentences fail equally to produce any reformatory or deterrent effect, we believe that the country and Parliament will be ready to make provision by which the incurably criminal may be treated in the same way as the incurably insane, and subjected, alike in their own interest and in that of the public, to some form of more or less permanent detention. As there are some criminals who ought never to be sent to prison, there are others who ought never to be released; and when this distinction is established, and provided for by legislation, it will be of even greater importance than at present to have an exact record of each criminal's offences.

Returning to the question of the sufficiency for this purpose of the present system, it appears to us that all the evidence which we have collected leads directly to the conclusion that, though it gives good results in a large number of cases, there remains a considerable number in which it fails. From the nature of the case positive evidence as to the number of habitual criminals who escape identification cannot be obtained, but the different police authorities whom we have consulted, though their bias would naturally be to minimise the proportion who escape, are fairly unanimous in thinking that an appreciable proportion of habitual criminals when arrested for new offences are not recognized.

At Liverpool it is thought that not more than 15 per cent. escape; at Nottingham, 10 or 15 per cent.; at Bristol, not more than 30 in a year; in the North Riding there are said to be "very few" prisoners whose antecedents are not made out. On the other hand the chief constable of Doncaster does not consider that the existing agencies are sufficient to ensure the majority of old offenders being identified, and believes that a large number of pickpockets arrested and dealt with summarily during race meetings are really old offenders who escape identification. The chief constables of Worcestershire, Newcastle-on-Tyne, Herts, Portsmouth, and Manchester are also agreed in thinking the existing means insufficient. These may be taken as fairly typical examples of such opinions as we have elicited on this subject, but we have little doubt that in small boroughs the proportion of habitual criminals whom the police fail to identify is considerably larger than in the more important forces from which we have mostly derived our information.

More interesting, perhaps, are the figures collected in Appendix A. 2, page 70, with regard to route-forms, and the results obtained by them. Thus at Doncaster during the year 1892 out of 407 persons who were arrested for all classes of offences, and of whom 272 are said to have been strangers to the borough, 46 were "routed"—28 before conviction and 18 after—30 were recognised as having been previously convicted, and 16 were not recognised. In Manchester out of 41 route-forms issued with photographs attached, during the twelve months ended 31st October 1893, 22 led to the suspected persons being identified as old offenders. In Newcastle-on-Tyne, during the same period, of 500 adults proceeded against for serious offences, 395 resided in the city, 80 belonged to the adjoining counties, and 25 came from further off; 23 prisoners were "routed", and of these 12 were traced. At Nottingham, during 1892, out of 58 prisoners "routed" 43 were identified by other police forces. Of 474 persons arrested at Scarborough during the last five years, 361 belonged to the district; and of 70 prisoners "routed," 34 were identified.

In Somerset, during the year ended 30th September last, of 515 persons arrested for offences involving dishonesty, 303 were natives of the county or permanently resident in it. Of 12 persons "routed," 6 were identified. The remark of the chief constable that these figures showed a higher per-centage of "foreign" crime than he had anticipated, is, we think, of some significance. It appears to us probable that police authorities are somewhat inclined to underrate rather than to overrate the number of "travelling thieves" who are to be found in different parts of the country; and, though this is only a matter of conjecture, we should not be surprised to find a

perfected system of identification demonstrating that the number of the criminal classes is smaller than is commonly supposed, but showing at the same time that increased facilities of communication have led to an increased activity in the operation of the "travellers."

In forming any inference from these figures it must be remembered that, in general, route-forms would only be sent out in the case of prisoners whom, from their general demeanour or their mode of procedure, there is good reason to suspect of being old offenders. Though, no doubt, some of the prisoners "routed," but not identified, had not in fact been previously convicted, it can scarcely be questioned that a certain proportion of the prisoners not "routed" were old offenders who were either not suspected of previous convictions, or were, in consequence of the triviality of their offence, dealt with summarily without any investigation of their antecedents.

A further indication of the inadequacy of the present system is afforded by a list supplied to us by the Prison Department in answer to our inquiry as to how many persons were recognised only after reception in convict prisons as being old penal servitude men. The list gives five instances of this occurring in the year ended 31st October last, and, in addition, two instances of persons summarily convicted being recognised after conviction as licence-holders. Though too much importance must not be given to individual cases, we think that, in view of the plain impossibility of ascertaining, even approximately, the total number that escape, it may be of interest to state briefly the particulars of these seven cases.

The first convict in the list was sentenced at Derby in April 1892, to seven years penal servitude for larceny from a dwelling-house. He was then known to have been twice previously convicted of larceny in Ireland in 1887, but of his history previous to that date nothing appears to have been known. In January 1893, on removal to Portland Convict Prison, he was recognised as a man who had been convicted of theft at Durham in 1879, and Glasgow in 1880, when he had received a sentence of seven years penal servitude. From the statements he has since made, he appears to be an old and experienced housebreaker.

No. 2 was convicted summarily, and had a sentence of three months at Southwark Police Court in December, 1892, for attempting to pick pockets. He was not at that time known to the Metropolitan Police, but in the January following, from information received, he was discovered to be an old offender several times convicted of theft at Birmingham, Norwich and elsewhere and given a life sentence at Leicester in 1877 for a murderous attack on a policeman. He had been released on licence in November 1892, and had gone to Manchester, but he left that place the same month, and coming to London failed to report himself to the police in pursuance of the conditions of his licence.

No. 3 was sentenced to three years penal servitude at Stafford for several burglaries. No previous convictions were recorded against him, but at Lewes Prison the Governor found some reason to suspect him of being an old offender. By means of a route-form he was ascertained to be a man who had previously received as many as three sentences of penal servitude—at Knutsford, Stafford and Wakefield—besides other minor sentences for burglary and similar crimes.

No. 4, after being 13 times convicted summarily during 1890, 1891 and 1892, was sentenced at Kendal Quarter Sessions, in October, 1892, to three years penal servitude. In August 1893, on his removal to Parkhurst Prison, he was recognised as a thief who had been sentenced to 12 months imprisonment at Northallerton in 1882, and five years penal servitude at Newcastle-on-Tyne in 1885.

No. 5 was a London thief who had been discharged on licence in July 1893 from his second sentence of penal servitude. The same month he was found attempting to pick pockets at Goodwood Races and was sentenced to six weeks imprisonment. It was only after his conviction that he was identified.

No. 6 was known to have been convicted at different times during 1888–92 at Maidstone, the Central Criminal Court, Leicester and Newington Sessions of housebreaking and kindred offences. When at Wormwood Scrubs, in September 1893, he admitted being a man who was sentenced at Exeter in 1880 to five years penal servitude for burglary.

No. 7 was given five years penal servitude at the Central Criminal Court in January 1893. It was known he had been twice previously convicted there in 1891 and 1892, but it was only after he was removed to a convict prison that, in order to repudiate another conviction of a much less serious character which had been attributed to him, he disclosed his identity with a burglar who had been frequently convicted in London prior to 1891. At the time of his conviction at the Central Criminal Court in 1891 he was wanted by the London police for having failed to conform to the conditions of the ticket-of-leave granted under a sentence passed on him in 1886.

The two cases in this list (2 and 5) of men convicted summarily, and afterwards found to be convicts under sentence of penal servitude, and at the time of their conviction at large on licence, are typical instances of a class of cases constantly coming to the notice of the Criminal Department of the Home Office, as in every such case the question of the revocation of the convict's licence is dependent on the decision of the Secretary of State. Several cases of this sort are quoted in Mr. Murdoch's evidence (page 64), and one of them is so remarkable that it seems to deserve special mention here. A convict under sentence of five years penal servitude, passed at the Middlesex Sessions, was released on licence in London in August 1892; in October he was brought up at the Mansion House Police Court for stealing a watch, and not being recognised was convicted summarily and sentenced to six weeks imprisonment. On reception into Pentonville his identity was discovered, and the Secretary of State thereupon revoked his licence. In ordinary course he was released on a new licence in August last. In

November he was again charged at the Mansion House Police Court, again treated as a first offender, and sentenced on this occasion to a term of three months imprisonment. Only on reception into Pentonville were his real name and antecedents again brought to light.

This case seems strikingly to confirm the evidence given by Mr. Douglas, Justices' Clerk at the Mansion House, as to the difficulty of obtaining identifications in London. It also supports an opinion expressed by Mr. Grace that it is in London that the largest number of failures to identify old convicts occur. In order to elucidate this point further, Mr. Farrant, of the Statistical Department of the Home Office, has at our request prepared a comparative table of the number of cases in which persons tried on indictment in London and in one or two groups of counties and boroughs, had previous convictions recorded against them in the prison calendars. For comparison with London we selected three populous counties, three large industrial towns, and two groups of counties where the population is mainly agricultural. The table, printed on page 72, shows that during the first three months of the present year in Lancashire, the West Riding of Yorkshire and Staffordshire about 70 per cent. of the prisoners tried were known to have been previously convicted; in Liverpool, Birmingham and Bradford, 79 per cent.; and in Norfolk and Suffolk, 61 per cent.; while in London the proportion was only 47 per cent.* It is impossible to suppose that the proportion of habitual criminals in London is smaller than in the other districts just mentioned; and the figures appear therefore to point irresistibly to the conclusion that in London the proportion who either escape arrest or when arrested escape identification is larger than in other districts. But, if this is the case, it cannot be stated too clearly that the reason is not any want of energy or ability on the part of the London police, but solely the incomparably more difficult problem with which they have to deal. In other places there is, speaking generally, no difficulty in dealing with the local criminal; it is only "travelling thieves" and the immigrants from other districts that are likely to escape identification, and these are not very numerous: in London local criminals have the same advantages for concealment that "foreigners" have in other places, while the proportion of "foreigners" is reasonably believed to be much larger. On the causes of this, the immense population within the area, its shifting character and the impossibility of any officer acquiring personal knowledge of more than a few criminals, we have already dwelt sufficiently; and it is only to be expected that in a system which depends so much on personal recognition the results obtained in London should be less complete than elsewhere.

(iii.) *Labour involved in the present System of Identification.*

But if the existing system leaves something to be desired in the completeness of the results obtained, there is, it appears to us, not less room for improvement in the working of its machinery. No one, however favourable the view he may take of the present system on the somewhat uncertain question of the proportion of old offenders recognized, would venture to say that the recognitions are obtained easily and without the expenditure of much labour. Thus, in using the Habitual Criminals' Register, when a prisoner has some special and unique mark, his identity may perhaps be discovered easily; but according to all the evidence we have received, the use of this register in ordinary cases is extremely laborious and it appears to be mainly on account of the time and labour which the searches involve, that it is generally so little used by the police. In Scotland Yard the process of identification is somewhat more easy, as regards the searching of the Mark Registers, but an enormous amount of time is spent in examining the books of photographs. It will be seen from the figures furnished by Chief Inspector Neame that on the 1st March last 21 officers searched for 27 prisoners—the total time spent being 57½ hours—and made 7 identifications. This was on average of more than two hours for each prisoner sought for, and more than eight hours for each identification.

The inspection of unconvicted prisoners at Holloway no doubt serves other uses and will have to be continued whatever new system may be introduced; but, viewed merely as a process of identification, it involves a large amount of labour for each recognition effected by the police. Thirty police officers attend there three days in each week, and in each week they obtain on the average about four identifications, not including those that are also made by warders; allowing four hours for the time spent by each officer at Holloway and in going and returning to his division, this means that the amount of detectives' time spent on each identification is about 90 hours.

* In the group of counties consisting of Dorset, Devon, and Cornwall, the percentage, as might be expected, is smaller than elsewhere.

In the case of route forms, which are looked on with so much favour by the country police, the work is distributed among a great number of officers of different forces, but it appears to us that if the whole amount of labour involved in each case could be summed up, this method would not show any economy of time and trouble as compared with the other methods and with the results achieved. It is plain that if a "travelling thief" contrives to conceal all indications of his place of origin, and does not carry on his person any very distinctive and indelible marks, the only way to trace his identity is to disseminate route forms broadcast among police and prison authorities. The shorter the interval between a criminal's arrest and his trial, the greater the difficulty of identification becomes, and the greater the necessity for multiplying the forms sent out. Inspector Reeve, of the Doncaster Police, mentioned to us a case in which route forms were issued by him to more than eighty places. One of these was recognised as far away as Swansea; the remainder merely served to give fruitless trouble at the places where they were received. This, perhaps, was an exceptional instance; but in any case where a zealous and industrious police force have a prisoner in custody, whom there is good reason to suspect of being a practised criminal, and whom there are no other means of identifying, the labour expended on the issue of route forms may be increased to an almost indefinite extent. Zeal and industry turned in this direction call for a corresponding amount of zeal and industry on the part of the people to whom the inquiries are addressed, and as we have already mentioned complaints on this score have reached us especially from Liverpool. When it is considered that in order to identify what he considers a "good" criminal, a police officer will often spend hours and sometimes days in searching the photographic albums at Scotland Yard, the labour involved by the route form method of procedure becomes apparent.

Nor do the suggestions made to us by different police forces tend for the most part towards the simplification of the machinery or the saving of labour. The point most generally urged is that regulations should be made for the photographing of unconvicted prisoners. This, as we have already intimated, we believe to be a very important amendment in the prison rules; but we cannot disguise from ourselves that its object is to increase the issue of route forms, and consequently to multiply the amount of time and labour devoted to their examination and circulation; and, as we have already said, we can recommend the increased use of photography only in connexion with a much more extensive change of method. Again, it has been urged repeatedly that it is highly desirable that distinctive marks should be registered more precisely, and in more detail, with measurements showing their size and position. Clearly this will give extra trouble to the warders to whom this duty falls, and, as will be seen hereafter, we can only recommend it if it be limited to such marks as are really clear and distinctive, and if the labour-saving devices adopted in France in the way of arrangement and abbreviations be adopted. We think an official list of abbreviations to be used in this service should be made out, such as *r* for "right," *l* for "left," *sc* for "scar," *f* for "finger" and so on. Each finger and each joint should be indicated by a number; conventional signs might be used to represent the forms and directions of scars or other marks, and a small rule should be employed to ascertain readily, for the purpose of registration, the distance of such marks as are recorded, from well-defined points of the body. With clear instructions no difficulty in reading the personal description of a prisoner should be experienced by warders, police officers and others occupied in the work of identification.

But even with more photographs and more exact descriptions we are agreed that the present system will leave much to be desired. What is wanted is a means of classifying the records of habitual criminals such that, as soon as the particulars of the personality of any prisoner (whether description, measurements, marks or photographs) are received, it may be possible to ascertain readily and with certainty whether his case is already in the register, and, if so, who he is. Such a system is not, we believe, attainable merely as a development of the existing English methods; if it is to be found at all, it must be found in the application of some such scientific method as those on which we have next to report.

THE BERTILLON SYSTEM OF IDENTIFICATION.

We deal first with the system of identification invented and carried into practice by M. Alphonse Bertillon. In order to study this system we visited Paris and saw the process in operation at the Prefecture of Police. We wish to take this opportunity of tendering our thanks to M. Lépine, the Prefect of Police, and M. Goron, the head of the

Service de Sûreté, for the courtesy with which they received us, and especially to M. Bertillon for the care with which he explained to us the details of the practical working of his system. Mr. E. R. Spearman, J.P., who has studied the Bertillon system during several years' residence in Paris, and who by his writings has done more than anyone to make it known in England, has, while we were in Paris and during all our inquiry, rendered us every assistance in his power, and we feel that to him also our thanks are due. Besides studying the system in Paris, we visited the prison at Pontoise in order to see the manner in which the measurements are taken in provincial prisons. We have further consulted eminent experts in anthropology in England on the scientific aspects of the system, and on this point would refer particularly to the evidence of Dr. Garson and Professor Thomson.

The principles and arrangements of the Bertillon system, or "Bertillonage" as it is conveniently called, are so well known that it will be sufficient for us to deal with them very briefly. They are most fully stated in the introduction to M. Bertillon's "Instructions Signalétiques" (Melun, Imprimerie Administrative, 1893); and an interesting account of the organisation of the Service d'Identification will be found in a pamphlet published as one of the Bibliothèque d'Anthropologie Criminelle et des Sciences Pénales bearing the title "L'Anthropométrie Judiciaire à Paris en 1889." (Paris: G. Steinheil, 1890.) In England the most complete accounts of the system of which we are aware are articles by Mr. Spearman in the "Fortnightly Review" of March 1890, and in the "New Review" of July 1893.

The principle of the system may be stated in a very few words. A record of each prisoner has first to be taken consisting of certain measurements which depend mainly on the length of bony structures in the body and may therefore be treated for practical purposes as invariable in adults; the cards on which these particulars are recorded are so classified that each can be found by means of the measurements and without the name of the person; and then by taking the measurements of any person who is arrested, it is possible to ascertain his identity if he is already included among the records under any name whatever. The special features of this system are the choice of the measurements to be taken and the mode of classification.

The measurements taken by M. Bertillon are the following:—

Height,
Span of arms,
Height of trunk (sitting height),

Length of head,
Width of head,
Length of right ear,
Width of right ear,

Length of left foot,
Length of left middle finger,
Length of left little finger, and
Length of left forearm.

In addition to these measurements the colour of the eye is noted. The measurements of each person on the first occasion when he passes through M. Bertillon's office are noted in duplicate on two cards, one of which is placed in an alphabetic register and the other in the "Anthropometric" or classified register.

The five most important measurements which form the basis of the classification in the Anthropometric register are the length and width of the head, the length of the left middle finger, the length of the left foot, and the length of the left forearm: these being selected as the most constant in each individual, the most varied in different persons, the least correlated to one another and the easiest to take accurately. The mode of classification, which is the most admirable part of M. Bertillon's system, is described by him as follows. He assumes that he has to classify in one cabinet the cards on which are recorded the measurements of 90,000 adult male prisoners. These he first divides into three classes according as the heads are "long," "of medium length," or "short." The measurements distinguishing long from medium and medium from short are selected so as to give approximately equal divisions of 30,000 cards each; the medium length is from 185 to 190 millimetres, heads of 191 or upwards are long, those of 184 or under are short. Each class of 30,000 is then subdivided into three classes of 10,000, according to the width of the head, the numbers distinguishing broad,

medium and narrow being again so selected as to give equal classes.* Proceeding in the same way, by the length of the middle finger each class of 10,000 is subdivided into three classes of 3,300; by the length of the left foot each class of 3,300 is subdivided into three classes of 1,100; and by means of the cubit or forearm we reach a subdivision in which each class is less than 400. This is a primary classification; we start with the cards of 90,000 criminals, and using each of the five measurements for the purpose of tripartite division we obtain 243 classes approximately equal and each containing on an average less than 400 individuals.

This classification is carried out in M. Bertillon's office in a cabinet which is first divided vertically into three divisions for long, medium and short heads; each of these divisions being divided horizontally into three sections for broad, medium and narrow heads, and again vertically for long, medium and short fingers. We thus have a cabinet divided into 27 sections as shown below:—

	Long Heads.			Medium Length Heads.			Short Heads.		
	Long Fingers.	Medium.	Short.	Long Fingers.	Medium.	Short.	Long Fingers.	Medium.	Short.
Broad Heads.									
Medium Width Heads.		(a)							
Narrow Heads.									

Each of the twenty-seven sections is then—as shown by dotted lines at (a)—divided into three shelves, in which the cards are arranged according to the length of the foot, the upper shelf containing the “longs,” the middle the “mediums” and the lower the “shorts.” Finally, in each shelf there are three drawers containing respectively the cards in which the forearm is long, medium and short. There are thus 243 drawers, each containing one class of cards numbering about 400; and, when the five measurements of any prisoner are ascertained, the drawer in which his card will be found can at once be determined.

A further subdivision of the cards in each drawer is next required, and this is given by the height, the length of the little finger, and the colour of the eye. By the height the cards in each drawer are divided into three divisions of about 140 each; by the measurement of the little finger each division of 140 is divided into three groups, which are not quite equal—the length of the little finger being too closely related to that of the middle finger to allow of the three divisions being made equal. Finally each of these groups, the largest of which contains about 60 cards, is divided by the colour of the eye—seven different colours being recognised—into parcels, containing on the average seven cards each, but varying in actual number from 3 or 4 to 15 or 20.

Let us see how this classified cabinet is used. All the prisoners arrested in Paris and the Department of the Seine on any criminal charge are brought every morning to the dépôt of the Prefecture of Police, and are there passed to M. Bertillon's bureau for measurement. A prisoner is first asked whether he has previously been measured, and if he admits that he has and gives his name, the card containing his measurements is obtained from the alphabetical register, and a few of the measurements taken in order to check the identification and prevent the exchange of names which is sometimes attempted. If he denies having been previously measured, his measurements and description are taken in full, that is to say, the 11 measurements given above are taken, the colour of the eye is noted, the shape of the ear and nose are also noted

* Owing to a slight correlation between the measurements, the numbers selected are different in different divisions. Thus in the division for long heads, the limits of the medium width are 155 and 159 millimetres; in the division for heads of medium length they are 154 and 158, and in the division for short heads, 153 and 157. The same is true of the other measurements and the difference is more marked, but the figures arrived at by M. Bertillon are too complicated to be given here. They will be found in Mr. Spearman's article in the “New Review” of July 1893, and show that M. Bertillon's measurements, though not closely correlated, are by no means altogether independent of one another.

(unless a photograph is taken), and the distinctive marks in different parts of the body are recorded with great exactness, the precise position and direction being stated, and their distance from certain fixed points measured. Search is then made in the classified cabinet to ascertain if there is a card containing his measurements taken on the occasion of a previous arrest. By means of the five primary measurements mentioned above the drawer in which his card will be found, if he has been previously measured, is first fixed; then by the height, length of the little finger and colour of the eye, the particular group of ten or a dozen cards in which his card will be placed, is determined. This group of cards is searched one by one, and by comparing the measurements just taken with those on each card in succession, his former card, if it exists, is picked out without difficulty. If it be found, the identification is verified, first, by means of the distinctive marks noted in both cases, and, secondly, by means of the description of the features or by the photograph. In this way an identification can be established which leaves no room for doubt, the correspondences being too close and too minute to be the result of chance.

The process would be extremely simple if all the measurements were absolutely invariable and could be made with absolute accuracy, but allowance has of course to be made both for slight variations in the parts measured and for slight errors on the part of the operators. The amount of the possible errors has been carefully tabulated by M. Bertillon, and the allowance to be made in each case definitely fixed. In the case of the length of the head, for instance, an allowance of one millimetre has to be made as regards measurements taken in Paris, but somewhat greater allowance for measurements taken in prisons elsewhere. If the prisoner's head is measured as 184 centimetres long, search for his card may have to be made both among the short heads (184 and under), and among the medium length heads (185 to 190), and similarly in the other cases. If a case should happen to be near the margin in each of the five primary measurements, search may have to be made in 32 drawers before it is ascertained for certain that the prisoner's card is not in the collection. Similarly if the height and the measurement of the little finger should be near the margin, or if the colour of the eye is transitional between two classes, duplicate searches may have to be made in each drawer. These duplicate searches necessarily occur in a large proportion of cases and add materially to the labour of using the register, as it is of course impossible to say that the card is not in the register until all the drawers and groups of cards in which the card sought for may possibly be found, have been exhausted. When the searches are numerous they are made in fixed order which secures that they are complete, and though they add to the labour of using the bureau, they are essential to secure accuracy in the results.*

There is a separate cabinet for women prisoners, arranged in the same way, but as the number is much smaller the classification is not carried quite so far, and distinctive marks on the face and hands only are noted.

There is also a separate cabinet for lads under 20, in whom the parts that are measured are still subject to growth, and the measurements therefore not final. The lads included in this cabinet are all photographed, and more reliance has to be placed on the photograph and marks than on the measurements in making identifications. It has also to be noted that, in dealing with adult male prisoners, M. Bertillon has now adopted a preliminary classification according to age, persons born in successive periods of 15 years being placed in separate cabinets. This of course often makes a double, sometimes a triple search necessary, as prisoners who give false names are ready to falsify their ages and often do so by many years; on the other hand it will in future greatly facilitate the weeding out of the cards of dead criminals and prevent such an accumulation of useless records as would become in time inevitable if all the cases were placed in the same collection.

It seems clear that in theory this system is perfect. If all the measurements were absolutely invariable and were taken with absolute accuracy, then, after measuring a prisoner, the card containing his previous record if it existed would be found at once and with certainty, and if not found in a particular set of cards in a

* "Ces explorations *limitées* allongent considérablement les recherches lorsqu'elles portent à la fois sur plusieurs mesures. Elles demandent alors à être dirigées dans un ordre constant et en suivant une loi mécanique de combinaisons qui a reçu des employés spéciaux qui en sont chargés le nom caractéristique de *recherches doubles*. C'est en elles que réside la seule difficulté de l'identification anthropométrique. Elles incombent d'ailleurs uniquement au personnel du service central. Les résultats obtenus en dix ans de pratique ont démontré que l'obstacle était aisément surmontable."—(*Instructions Signalétiques*, ed. 1893, p. xxiv.)

particular drawer it would be known that the case was not in the register. Further, for a certain margin of error arising either from variation in the parts measured or from a failure on the part of the operator, provision can be made by process of double or multiple searches. There still remains, however, the practical question whether the efficacy of the system is vitiated either by not allowing sufficient margin for necessary errors and variations, or by carelessness on the part of employees in making gross errors of measurement, in misplacing cards in the register or in making insufficient searches. We satisfied ourselves that in all these particulars precautions had been taken by M. Bertillon, the margins of variation which he gives are the results of many years' experience,* and checks are provided to secure the accurate putting away of cards and the thoroughness of the searches. And so far as we can form an opinion of the statistical results of his system, we find reason to think that the precautions are sufficient.

We take first the figures of the number of measurements and of identifications made in Paris :—

(1.) Year.	(2.) Total Measurements taken.	(3.) Identifications of Persons giving false Names.	(4.) Re-measurements of Persons admitting their Identity with Persons on Register.	(5.) New Measurements.
1885	14,965	424	4,040	10,501
1886	15,708	352	4,694	10,657
1887	19,150	472	6,347	12,331
1888	31,289	527	14,465	16,297
1889	34,515	622	17,585	16,308
1890	34,328	614	19,517	14,197
1891	36,204	600	21,167	14,437
1892	40,312	674	25,448	14,184

At first sight the number of identifications seems small, but on reference to Column (4) it will be seen how large a proportion of persons previously measured admit their identity, and can be traced by their names. This is said to be due in a great measure to the efficiency of the Bertillon system—old offenders knowing that it is useless to attempt concealment—and this view is borne out by the fact that a considerable number, about 500 a year on the average of five years, have given false names on arrest but have confessed their identity on being brought to be measured in the Bertillon Bureau. However this may be, these figures give no basis of comparison with the numbers of identifications said to be made by the English police, as it is clear that for whatever reason a much larger proportion of re-arrested criminals give their true names in France than in England. In France only one "recidivist" in 15 gives a false name; in England the exact proportion cannot be given, but it is certainly much larger than this, probably a majority. Further, in England a prisoner cannot be questioned as to his criminal antecedents; so that even if he has given his true name, it still remains to identify him,—to show that he is the same person who was convicted under that name on some previous occasion. This is often a matter of considerable difficulty, and such identifications are included in the figures furnished by the English police. Clearly then there is in England a larger proportion of prisoners requiring to be identified; and if the English system makes any approach to efficiency, it must show a much larger proportion of identifications than in France.

The true test, however, of the efficiency of a system of identification is not the number of identifications made, but the number of mis-identifications or of failures to identify.

* With regard to the amount of the possible variation in the Bertillon measurements, reference should be made to the evidence of Professor Thomson (pp. 64-67), and to that of Mr. Galton (Q. 240-245, p. 59). It seems desirable that account should be taken, in dealing with the head measurements, of a somewhat greater range of variations than is admitted by M. Bertillon. This point is not, however, discussed in detail in the report, because the Committee are satisfied that it does not affect the principle of the system, nor interfere with its practical efficiency. The number of cases for which the margins allowed by M. Bertillon would not provide, must in any case be small, and if the system should be adopted in England, it will be easy with scientific advice to adjust the margins so as to provide even for exceptional cases.

As regards mis-identification, in England the most that can be claimed is that mistakes are very few, and that those which have occurred have been corrected either when the evidence of identification came to be examined in court or when special inquiries were made on the appeal of the convicted prisoner to the Home Secretary. In France, on the other hand, M. Bertillon claims that of all the identifications made in his office during the past 11 years not one has proved wrong. It is certain that though the opportunities of appeal which a prisoner enjoys in France are at least as ample as in England, every one of M. Bertillon's identifications has been confirmed by the final judicial decisions; and looking at the enormous safeguards which his system affords in the numerous measurements each of which must correspond within certain limits in order that an identification may be established, in the photographs or descriptions substituted therefor, and in the precision with which all distinctive marks are catalogued, we feel no difficulty in believing that under his system a mis-identification is practically impossible.

The other test is the number of cases in which failure to identify occurs. Of this we can only judge by the number not identified *before* conviction whose identity is *afterwards* discovered. In England we have no exact statistics on this subject; but some figures and examples have been given in an earlier part of our report which show, we think, conclusively that the number is considerable. In France the matter is put to a very severe test. In 1887, when it was decided to abolish the granting of rewards for identification, a "gratification" of 4,800 francs a year was granted to the assistants in M. Bertillon's bureau subject to a deduction of 10 francs to be paid as a reward to any prison warder who might identify an old offender who had escaped recognition in M. Bertillon's office. The result of this exacting test was that in 1889 of 31,000 persons measured in the bureau only 14 were afterwards recognised as old offenders, and of these 10 had never before been measured, and could not therefore have been identified by M. Bertillon's staff. There remained, therefore, only *four* failures to be set against M. Bertillon. In 1890 the number of failures was *four*, in 1891 *six*, and in 1892 *none*. These results, which we see no reason to question, appear to be eminently satisfactory.

So far we have dealt only with the results of the system as applied in Paris where it has been in operation for 11 years. Its application to France as a whole is yet in too early a stage to allow of our speaking of it in the same way. M. Bertillon freely admitted that in some of the prisons there were not yet any warders trained to perform the measurements with the requisite accuracy; and that a much greater margin for error is allowed for measurements taken outside Paris than for those taken at his own office. The country magistrates do not appear to have yet recognised fully the value of the system; and though he receives from the prisons the measurements of nearly 70,000 prisoners in each year, the number of cases in which M. Bertillon is asked to make identifications is comparatively small. It seems to us, however, that the results obtained in Paris, where the system has so long been in operation, are amply sufficient to show its practical efficiency, and the chief point of interest to us in its application to this country was to ascertain whether men of the class of prison warders can be trained to take the measurements with sufficient accuracy. M. Bertillon's reply to this question is that while he finds a certain proportion of those sent to his office for training to have no aptitude for the work, a large number can in a comparatively short time be trained to take the measurements with the necessary accuracy and that in time he would be able to provide an efficient staff at all the prisons. When we visited Pontoise, we formed a very favourable opinion of the work done by the warder employed in taking measurements in that prison.

It remains only to add that we find the opinions of all persons qualified to judge of the efficiency of the system by practical acquaintance with its working unanimous in recommending it. M. Goron, the head of the Paris detective police, and himself an officer of the greatest skill and experience, spoke to us in the strongest terms of its practical utility. Colonel Talbot, the military attaché to the British Embassy in Paris, reported in 1890 that he had studied M. Bertillon's system, and arrived at the conclusion that its adoption by military authorities in this country would "put an end to "fraudulent enlistment." We may refer also to the evidence of Sir Richard Webster (p. 48), who has made several visits to the office of M. Bertillon and who recommends the adoption of his method mainly because it would, in his opinion, afford a complete protection to an innocent man against any possibility of a wrong identification.

In Appendix D. will be found an account of the introduction of the Bertillon system in France and other countries.

THE FINGER PRINT SYSTEM.

The second system on which we are specially directed to report is that now associated with the name of Mr. Francis Galton, F.R.S., though first suggested and to some extent applied practically by Sir William Herschel. In Mr. Galton's "Finger Prints," published by Messrs. Macmillan & Co. in 1892, a very full account of this system is given; but, as the author investigated the subject originally from the anthropological point of view, and was chiefly interested in its bearings on questions of heredity and racial distinctions, the book is likely to give a somewhat exaggerated impression of the complexity and difficulty of the method as applied to purposes of criminal investigation. A visit to Mr. Galton's laboratory is indispensable in order to appreciate the accuracy and clearness with which the finger prints can be taken and the real simplicity of the method. We have during this inquiry paid several visits to Mr. Galton's laboratory; he has given us every possible assistance in discussing the details of the method and in further investigating certain points which seemed to us to require elucidation. He also accompanied us with his assistant to Pentonville Prison, and superintended the taking of the finger prints of more than a hundred prisoners.

The materials on which Mr. Galton works are impressions taken from the bulbs immediately below the tips of the fingers and thumbs. The papillary ridges which cover the palms of the hands form at this point patterns of well-marked form and of a curious variety and shape; of these patterns impressions or "imprints" can be taken on paper or cardboard by means of printers' ink, so as to show the directions, terminations, and junctions of the ridges with much greater clearness than can be seen on the hand itself; and these imprints can be examined through a lens or microscope, or can be enlarged to any size by means of photography. The patterns and the ridges of which they are composed possess two qualities which adapt them in a singular way for use in deciding questions of identity. In each individual they retain their peculiarities, as it would appear, absolutely unchangeable throughout life, and in different individuals they show an infinite variety of forms and peculiarities.

Both these qualities have formed the subject of special investigation by Mr. Galton; and having carefully examined his data, we think his conclusions may be entirely accepted. The persistence of the ridges and patterns has been proved by the examination of imprints taken from the fingers of various persons after intervals of years and minutely compared in every detail. The cases taken extend over the whole of life, from infancy to extreme old age, not of course in one individual, as no records are available of older date than 30 years, but the different cases taken together cover the whole period. In all the cases examined there was only one instance in which a minute detail was found to vary—a case where a ridge which bifurcated in an impression taken at the age of $2\frac{1}{2}$ was found to have united at the age of 15. In all the cases where the finger prints of adults taken at different ages have been compared the correspondence has been found to be exact.

In studying the variety in the finger prints of different individuals, account has to be taken not only of the general form of the pattern and of the number of ridges between fixed points, but also of all the *minutiae* appearing in each finger print—breaks, junctions, bifurcations, &c.—which are equally persistent with the general form of the pattern. We cannot here set out the details of Mr. Galton's reasoning as to the number of possible variations in a single finger print, but it is sufficient to state that the conclusion at which he arrives is that the chance of two finger prints being identical is less than one in sixty-four thousand millions, that is to say, if the number of the human race is reckoned at sixteen hundred millions, there is a smaller chance than one to four that the print of one finger of any person should be exactly like that of any finger of any other person. If, therefore, two finger prints are compared and are found to coincide exactly, it is practically certain that they are prints of the same finger of the same person; if they differ, the inference is equally certain that they are made by different fingers. The prints of one finger, if clearly taken, are therefore enough to decide the question of identity or non-identity, and if the prints of three or more fingers be taken and compared, all possibility of error is absolutely eliminated. We are clearly of opinion that for the purpose of *proving* identity the finger prints examined and compared by an expert furnish a method far more certain than any other. They are incomparably more certain than personal recognition or identification by photograph. Under the Bertillon system it is conceivable, though most improbable, that two persons might have measurements coinciding within the limits which have

to be allowed for error, and that they might also have the same distinctive marks; but it is wholly inconceivable that two persons should show an exact coincidence in the prints of two or three, not to speak of ten, fingers.

There is, however, the further question how far the finger prints can be used for the purpose of *tracing* identity, that is to say, how far they can be classified. Mr. Galton founds his classification on three forms or types of pattern, to one or other of which every finger print may be assigned, viz., "arches," "loops" and "whorls." In all digits the ridges immediately adjoining the third joint run across the finger, while those towards the tip follow the form of the nail in a rounded arch, but in the space left at the centre of the bulb the ridges have various curvatures forming the pattern of the finger print. The pattern is an "arch" when the ridges in the centre run from one side to the other of the bulb without making any backward turn or twist; a loop, when there is a single backward turn but no twist; and a whorl, when there is a turn through



ARCH.



LOOP.



WHORL.

at least one circle, or a double turn in the form of a duplex spiral. (Galton's "Finger prints," page 78.) Typical specimens of these three forms of patterns are given in the illustration above. The general form of the patterns only is shown, as the precision and delicacy with which the minutiae appear in imprints taken direct from the finger, cannot adequately be reproduced here.

In reading off the patterns and translating them into symbols Mr. Galton takes the prints of the ten fingers in the following order: the first, second and third finger of the right hand, the first, second and third finger of the left hand, the thumb and little finger of the right hand, the thumb and little finger of the left hand; and marking an arch as "*a*," a loop as "*l*," and a whorl as "*w*," he obtains a formula for each person in some such form as *alw*, *all*; *wl*, *ll*.

In order, however, to give greater variety in the formulæ, he distinguishes on the fore-fingers between loops coming from the radial or thumb-side of the hand, and loops from the ulnar or little finger side, the former being marked "*r*," and the latter "*u*." In the other fingers so large a proportion of the loops come from the ulnar side, that nothing would be gained by carrying this distinction further. As examples of the formulæ thus obtained, we give those of Mr. Galton himself, and of the members and Secretary of the Committee.

- (1.) *wll*, *wll*; *wl*, *wl*.
- (2.) *wll*, *ull*; *ll*, *ll*.
- (3.) *rl*, *ul*; *wl*, *ll*.
- (4.) *rw*, *rl*; *wl*, *wl*.
- (5.) *rlw*, *ulw*; *ll*, *ll*.

Each person thus possesses a formula which is, as it were, a personal name, that may be read from his finger prints, and for the purpose of an index these formulæ are arranged in alphabetical order, like the names in the alphabetical list in a directory.

A difficulty is caused in some of the formulæ by transitional forms of patterns, but this Mr. Galton meets by adding to the letter that best represents the pattern a second letter representing the alternative interpretation. Thus, in the second formula given above, *l*, represents a pattern which he considers to be a loop, but which might possibly be read as a whorl. With this precaution a form transitional between one pattern and another presents no more difficulty than a name which is spelt different ways; and just as in an alphabetical list of names we should look under "Thomson" for a name we had failed to find under "Thompson," so the formula in question would be treated as though there were some doubt as to the right way of spelling it.*

The number of possible formulæ, if the arches, whorls and loops occurred quite indiscriminately, would be 104,976, and if that were so there would be no difficulty in

* For the further use of subordinate symbols to mark special features in the form of patterns, see Appendix G.

classifying in this way 100,000 imprints, or even a much greater number. Unfortunately for the purpose in view the different patterns do not occur indiscriminately. The arches are much less frequent than the other patterns; there is a tendency for particular patterns to occur more frequently in particular fingers; and there is also apparently a tendency in certain hands to repeat the same pattern on all the fingers. The result is that in the collection of 2,645 cards examined by Mr. Galton, while a considerable number of formulæ occurred only once, there were no less than 12 particular formulæ which occurred oftener than 26 times, that is in more than 1 per cent. of the cases, while one formula (*ull, ull; ll, ll*) occurred 164 times or in 6 per cent. of the imprints. It is therefore clear that while this mode of classification is useful for a small collection it would be insufficient to index a large collection consisting of many thousand cards. To carry further the comparison with the alphabetical list of names already suggested, it is as if, in a list of proper names, the name "Smith" made 6 per cent., and "Jones" and "Thomson" 3 per cent. of the whole, and it was therefore necessary to find further names for indexing the persons bearing the same surname. At our suggestion, Mr. Galton carried further an investigation which he had already begun as to how far a sub-classification of the commoner formulæ is possible. He has devised for this purpose an ingenious system, depending partly on the number of ridges in each loop and partly on minutiae in the core of the pattern. Some account of this is given in Appendix G.*; here it must suffice to say that, on testing him with duplicates of finger-prints of the *ull, ull; ll, ll* type, we found that he was able without difficulty to select the proper card; that is to say, he readily picked out by means of one set of imprints the card containing the imprints of the same person from among the 164 cards of the *ull, ull; ll, ll* type. He showed himself able, in fact, by finger-prints alone, to discover at once the identity of any one of the 164 persons whose formulæ were of that type which presents by far the greatest difficulty in classification.

The conclusion at which we have arrived is that for a small collection of cards, say, under 1,000, Mr. Galton's system is admirable. Even if no sub-classification be adopted, it is always found that on some one or other of the fingers the pattern contains some well-marked peculiarity, and there is no difficulty in running through 50 or 60 cards (to take the most numerous type) and ascertaining at a glance whether on any of them this particular feature presents itself. If however Mr. Galton's system of classification is to be applied to a larger collection than 1,000 cards, it becomes necessary to introduce the sub-classification. This could certainly only be carried out by a thoroughly trained expert, and, though the results of our trials in Mr. Galton's collection of 2,500 cards were eminently satisfactory, it is still a question how far the same method could deal effectively with a much larger collection.

It remains to mention one or two practical points on which we had to satisfy ourselves before deciding that Mr. Galton's system could be used for the purpose of proving or of tracing identity.

(i.) It has been suggested that the finger-prints could easily be altered or removed, and if this were so it would be a fatal objection to their use. We thoroughly satisfied ourselves that they could not be altered so as to cause any possibility of mis-identification; they can of course be altogether destroyed, but this would be a difficult and painful operation and would at once afford a new personal mark of a most distinctive character. Cuts and ulcers destroy a portion of the ridges, but generally leave the pattern perfectly distinguishable; in any case they could not possibly cause such a change as might lead to a mis-identification. In the classification of imprints a finger in which the pattern is destroyed assists the classification; it is represented by the symbol *x*, and gives a further set of formulæ in which the constantly recurring *a*'s and *l*'s are varied by an occasional *x*.

(ii.) It may also be objected that this mode of identification would be rendered futile by the liability of the ridges to become obscured in the hands of persons engaged in manual labour. It is true that this is in some degree the case as regards persons employed in hard manual labour, but it does not affect the majority of habitual criminals, who when at liberty are not distinguished for their application to manual labour and who are not employed in prison in forms of labour which produce this result. We took at Pentonville the finger-prints of 100 prisoners, most of whom were engaged in oakum picking, some were stokers, and some bakers and tailors. In every case we obtained perfectly clear and complete finger-prints, the only two exceptions being a prisoner who had lost a hand and another who had lost one of his fingers

* Reference may also be made to Mr. Galton's evidence, Q. 222-232, p. 58.

(iii.) It has further been suggested that the finger-prints are too complicated and difficult to be understood and used by warders or policemen. This is true as regards identification and classification, and would be a serious objection if this part of the work had to be done in prisons or police stations; but it is obvious that the classification and comparison of the imprints would be carried out entirely at head-quarters and by an expert. All that the warders would have to do would be to take the finger-prints—a simple mechanical process which any warder could learn without difficulty. At Pentonville a warder with no previous practice whatever took in an hour 35 sets of impressions of three fingers, each in duplicate, and every one of these was easily decipherable.

(iv.) One more objection which has been made to the use of finger-prints is that they could not be used for purposes of proof in courts of law. We are not by any means sure that this is the case. If enlarged photographs of finger-prints were produced, and were explained by counsel to a jury, we believe that at the cost of some time and trouble proof of identity could be established; but for the purpose now in view this is not necessary. What is required is in the first place assistance in tracing the criminal, and secondly a check to prevent the occurrence of mistakes in the ordinary process of identification by means of personal recognition. In tracing a criminal the finger-prints would be of much assistance. For verifying identifications they would give a test, which in the hands of a skilled person would be unimpeachable.

It seems impossible to insist too strongly on the absolute certainty of the criterion of identity afforded by the finger-prints. Considered merely as a test of identity and not as a detective agency—there being no longer any question of classification—their use becomes at once extremely simple, and in the hands of an expert free from any danger of error. Apart altogether, therefore, from their use in tracing habitual criminals, it would be a very easy matter to use them much more extensively as a check to all identifications. If the prints of three fingers only of every criminal prisoner were taken before his discharge, and kept with his papers in the prison, it would be impossible afterwards wrongly to attribute the conviction to any other person. This would cover, for instance, the case of Callaghan mentioned on page 14, a case which would not come within the scope of the system we propose to recommend for the identification of habitual criminals. So if the finger-prints of pensioners were taken and kept with their papers, an absolute test would be available if any question of fraudulent drawing of the pension (*e.g.*, after the death of the pensioner) should ever arise.

These last suggestions, however, go somewhat beyond the main point which we have still to deal with in our report. We have completed our account of the three systems of identification mentioned in the first part of the reference, and we shall now proceed to answer in explicit terms the questions put in the latter part of your Commission.

I. WHETHER THE ANTHROPOMETRIC SYSTEM OR THE FINGER PRINT SYSTEM CAN WITH ADVANTAGE BE ADOPTED IN ENGLAND.

The conclusion at which we have arrived with regard to the English methods is that they are on the whole fairly effective; that the majority of old offenders who are arrested for new offences are in the long run identified, and that cases of misidentification are extremely rare. On the other hand, some of the methods in use involve the expenditure of much labour and time, and in spite of the best that can be done, it is clear that a certain proportion of old offenders, small in some districts, considerable in others, escape identification altogether. If a system can be adopted which will secure the prompt and easy recognition of every old offender the ends of justice will be furthered, a great administrative improvement will be effected, and much expense will ultimately be saved.

Before considering the question further, it may be well to say at once that in no circumstances can the system of M. Bertillon be adopted in its entirety on account of the fundamental differences between French and English judicial procedure. In Paris every person arrested for any offence is at once subjected to the process of measurement and is sometimes photographed before being brought before any magistrate. It would not be consistent with English ideas to entrust to the police an arbitrary power of measuring or photographing every person arrested without authority from a magistrate and without regard to the necessity for the purposes of justice of discovering his antecedents and character. Nor do we think that, if the Bertillon system is adopted in principle, its indiscriminate application will be necessary for the purpose in view. The enormous number of measurements taken appears to us to be likely even in France to cause ultimate difficulty, and in England so extensive an application of the system would certainly hamper its first introduction.

In deciding what system should be adopted, three main conditions may be laid down:—

1. The descriptions, measurements or marks, which are the basis of the system, must be such as can be taken readily and with sufficient accuracy by prison warders or police officers of ordinary intelligence.
2. The classification of the descriptions must be such that on the arrest of an old offender who gives a false name his record may be found readily and with certainty.
3. When the case has been found among the classified descriptions, it is desirable that convincing evidence of identity should be afforded.

The 1st and 3rd of these conditions are met completely by Mr. Galton's finger print method. The taking of finger prints is an easy mechanical process which with very short instruction could be performed by any prison warder. While in M. Bertillon's system a margin greater or less has always to be allowed for errors on the part of the operator, no such allowance has to be made in Mr. Galton's. Finger prints are an absolute impression taken direct from the body itself; if a print be taken at all it must necessarily be correct. While the working of this system would require a person of special skill and training at headquarters, it would have the enormous advantage of requiring no special skill or knowledge on the part of the operators in the prison, who would merely forward to headquarters an actual impression taken mechanically from the hand of the prisoner. With regard to the third condition again, as we have already pointed out, Mr. Galton's system affords ample materials for conclusive proof of identity: the imprints of the ten finger tips give such enormous scope for variation that if two sets are found to correspond exactly within the portions common to the two impressions, it becomes impossible to doubt the identity of the persons. It is true that this evidence can only be deciphered in detail by an expert, and that it could not at present be substituted in legal procedure for the ordinary evidence of identity from personal recognition; but this would not affect its value as a complete check on the accuracy of the ordinary evidence.

The Committee were so much impressed by the excellence of Mr. Galton's system in completely answering these conditions that they would have been glad if, going beyond Mr. Galton's own suggestion, they could have adopted his system as the sole basis of identification.

When, however, the second condition is approached, serious difficulties arise. The method of classifying finger marks proposed by Mr. Galton affords, as we have seen, an admirable means of indexing a comparatively small collection, and the difficulty which arises from the transitional forms is not insuperable; but when the method is applied to a large collection amounting to many thousands, as would be the case in a Criminal Register, the difficulty arising from the inequality of the classes becomes serious. One class alone includes 6 per cent. of the whole number of imprints, and several other classes include 2 or 3 per cent. each. In a collection of, say, 25,000 imprints (and it is probable that the number will be greater than this) it would be found that 1,500 imprints would fall into one class, while there would be several other classes each containing between 500 and 1,000 imprints. The sub-classification of the largest class, which Mr. Galton at our suggestion carefully worked out, is very elaborate, and in the matter of the counting of the number of the ridges in the loops, it seems to us open to some uncertainty; and we believe we are only following Mr. Galton's own opinion in saying that it would not be desirable to adopt it for a very large collection if any better system is available.

On the other hand, the strongest point in favour of M. Bertillon's system is the method of classification. If absolutely invariable and accurate measurements could be obtained, then from the measurements of any person the card giving his name and antecedents could be found in M. Bertillon's cabinet as certainly and almost as quickly as an accurately spelt word could be found in the dictionary. Absolute perfection is of course not obtainable, all measurements being subject to error arising from actual variations in the body and from want of skill in the operator; but these causes affect some measurements in a much slighter degree than others, and by selecting five measurements which are least subject to variation in adults and which can be taken with the greatest accuracy by ordinary operators, M. Bertillon has obtained a primary basis of classification as nearly perfect as possible. By means of these five measurements, each divided into "long," "medium" and "short," M. Bertillon obtains 243 classes, represented by the 243 drawers in his cabinet,

and these classes are approximately equal. Where a measurement lies near the margin of two classes it may be necessary to search for the case in two of the drawers; if two measurements be on the margin it may be necessary to search in four of the drawers, but even in the extreme case where each of the five measurements lies on the doubtful margin between two classes it would be necessary to search in only 32 out of the 243 drawers. It seems impossible to us to improve on M. Bertillon's system so far as this primary classification is concerned. Other measurements were suggested to us by Mr. Galton and Dr. Garson, which have special points of superiority to those of the middle finger and the foot,* but on the whole the balance of advantage appears to be in favour of the five chosen by M. Bertillon, even apart from the fact that it is desirable for international purposes to have the same basis of classification in England as in France. The taking of measurements, though it requires some training, does not require any high degree of skill, and we are thoroughly satisfied after seeing the process in operation in France that there would be no difficulty in training English warders of ordinary intelligence to take them with the required accuracy. On this point we would refer also to the evidence of Dr. Garson, who has practical experience in training assistants in anthropometry.

The case is different, however, when we come to the further sub-divisions of the Bertillon classification, those by the height, the length of the little finger and the colour of the eye. The length of the little finger is closely correlated with the length of the middle finger; in most cases where the one is long, the other is long also. The height again is a very unsatisfactory measurement; it is subject to variations in the same person, and it may be altered by trickery on the part of the person measured. By the Metropolitan Police a margin for error of two inches in each direction is allowed in classifying cases by height. Even with the greater accuracy of the French measurement a considerable margin has to be given. The accurate description of the colour of the eye is still more difficult. The seven colours taken by M. Bertillon can be discriminated only by persons having much practical experience, and even then many doubtful and transitional cases must occur.

In adapting M. Bertillon's system to English use we think it would be desirable to abandon these criteria and make the final classification dependent on the finger-prints.

Our recommendation, therefore, is that the prisoners who are to be included in the register should be measured as regards the length and breadth of the head, the length of the left middle finger, the length of the left forearm and the length of the left foot; that these should form the primary classification, giving 243 nearly equal classes; that the finger-prints of each prisoner should be taken and that the sub-divisions should be by means of Mr. Galton's method of classifying the finger-prints. The measurements and finger-prints should be taken in prison by prison warders, and should be afterwards classified and used for identification in a central registry for the whole of England.

We think that this system should not in the first instance be applied to all persons convicted of crime, but only to all convicts and to habitual criminals, that is, persons coming within section 7 of the Prevention of Crimes Act, 1871. The Registrar might also have a discretion, on application by the police, to add to the Register a limited number of other prisoners who, though only once convicted, are reasonably believed to belong to the class of travelling thieves.

We further recommend that in all cases photographs should be taken; they are of much use in making the search in the Register, and, when the case is found, they afford in most cases a ready and obvious evidence of identity. The finger-prints will, however, afford in most cases the scientific proof of identity, and, wherever the system is applied, will render a wrong identification practically impossible.

II. WHETHER THE PROPOSED NEW METHOD SHOULD BE IN SUBSTITUTION FOR OR SUPPLEMENTARY TO THE EXISTING METHODS. /

Our answer to this question is that, in the first instance, it should be supplementary to the existing methods and not in substitution for them. It must take several years before the new system is in full operation, and until then it will be necessary to continue all the existing devices for identifying old offenders. Even when the new system is introduced, as it is proposed to confine it almost entirely to convicts and habitual criminals, it will be necessary that, except in the case of convicts, at least one

* If it were found desirable to add a sixth measurement, the measurement of the breadth of the face, suggested by Dr. Garson, has great advantages. (See the evidence given by him, Q. 38-43, p. 50, by Mr. Galton, Q. 247, and by Professor Thomson, Q. 422-424, p. 66.)

previous conviction should be proved against the prisoner before he is placed on the Register.

We think, therefore, that the practice of metropolitan police officers visiting prisoners at Holloway must be permanently continued and that a similar system might with great advantage be introduced in other prisons out of London.

The Habitual Criminals Register, which is used with some success by a large number of police forces, should certainly be continued in its present form with any improvements that may be possible, until experience shows that the need for it no longer exists. The same may be said of the various registers kept in Scotland Yard and by the chief provincial police forces; they should be continued until gradually and naturally superseded by the new system.

The issuing of route forms should also be continued in the same way, and in a limited number of cases the practice will have to be continued permanently unless a wider range should hereafter be given to the system of measurements and of finger-prints which we have now recommended.

III. WHAT MEANS SHOULD BE ADOPTED FOR PUTTING INTO PRACTICE THE METHOD OF IDENTIFICATION RECOMMENDED.

We now propose to describe in detail the arrangements which we think should be followed if the preceding recommendation is adopted. No doubt some of our proposals will have to be modified as practical experience suggests improvements, and it will be important that the possibility of improvement should be kept steadily in view.

In the first place, it will be necessary before their discharge to measure, &c. those convicted prisoners whom it is proposed to put on the Register. The process will be—

(1.) *To photograph them as at present.*—It has been strongly represented that the photograph of the side face should not be taken, as now, by means of a mirror, but should be, as in France, a second distinct photograph on the same plate. This has the advantage, first, of giving a clearer portrait and showing very distinctly the forms of the ear and nose, which are the most important features for purposes of identification, and, secondly, of not reversing the sides of the face, a change which sometimes causes confusion. It would, however, involve some additional expense; and the photographs which have been sent us by the Austrian Government as well as many taken in English prisons, show that very good results are obtainable by means of the mirror. The important point is that there should be a perfectly clear side photograph showing distinctly the profile and the form of the ear.

(2.) *To take the five measurements required for purposes of classification, viz., the length of the head, the width of the head, the length of the left middle finger, the length of the left forearm, the length of the left foot.*

This should be done in accordance with the instructions printed in Appendix E., which have been adapted from those issued by M. Bertillon.

The measurements should be taken with the same instruments as in France, and should be stated in millimetres. The millimetre gives exactly the degree of accuracy that is required, and its use will much facilitate identification in international cases. It would of course be possible to take the measurements in inches, and in twentieth parts of an inch, but this would give awkward and complex figures; while if millimetres are taken, a single number represents each result. It requires no knowledge of the metric system on the part of the operator, who has merely to read off the figures from the instrument. The evidence of Dr. Garson, who has had large practical experience in training Englishmen to take measurements in millimetres, is convincing on this point.

(3.) *To take the finger prints* by Mr. Galton's method. This should be done in accordance with the instructions in Appendix F.

(4.) *A description* should also be taken as at present, but somewhat briefer, including the height in feet and inches, colour of hair, eye and complexion, and the distinctive marks. This is not required for the purpose of classification; but it is necessary (a) in case the arrest of the criminal should be required while he is at large, and his description has to be published for this purpose; (b) in case his identity should be disputed, when the distinctive marks often supply the evidence which can most easily and most satisfactorily be put before a jury.

The marks noted should, however, be those only which are definite and distinctive. Their position, size, and direction should be given accurately and abbreviations should be used according to the suggestions we have made above, page 19. They should be

arranged in a fixed order, beginning with the head, then the hands and arms, then the body, and last the legs and feet. Instructions on this point are contained in Appendix E.

These measurements, &c. should be recorded on a card of the size now used by Mr. Galton (12 inches by 5). On the back of this card will be the finger prints, on the face the other particulars arranged as follows:—*

Head, length _____	Name _____	Finger Print Formula _____
„ width _____	No. _____	
Left middle finger _____	Date of birth _____	
Left forearm _____	Place of „ _____	
Left foot _____	Particulars of convictions—	

Height _____	_____	
Eyes _____	_____	
Hair _____	_____	(Photograph.)
Complexion _____	_____	
Distinctive marks—		
I. _____		
II. _____		
III. _____		
IV. _____		
V. _____		
VI. _____		

This card will be prepared in duplicate and forwarded to the Central Registry. One card will be placed in an alphabetical register for use when the prisoner's name and antecedents are known. The other will be arranged in the classified Index Register.

The arrangement of this Index Register will be the same as M. Bertillon's, a cabinet of drawers first divided vertically into three divisions according to length of head, and horizontally according to width of head. The nine sections thus formed will be divided vertically according to length of finger and horizontally according to length of forearm, and again vertically according to length of foot. There will thus be 243 drawers each containing one class of cards. The figures which are to determine the "long," "medium" and "short" of the several classes might be borrowed in the first instance from M. Bertillon, but in that case on account of racial differences they would have ultimately to be altered in order to keep the classes equal in size. It would be best therefore that the measurements taken in this country by Mr. Galton and by the Anthropological Institute should be utilized, and correct figures for England fixed from the outset. See the evidence given by Dr. Garson, page 53.

At the outset, while the number of cards is few, it may suffice to use only four measurements for classification, omitting the foot, and thus making only 81 classes. In any case, however, the measurement of the foot should be recorded, so that it may be available afterwards if required for further classification.

Before each card is put away in its proper drawer the finger print formula will be determined according to Mr. Galton's method. This will be noted conspicuously on the face of the card in the right-hand top corner above the photograph. The cards in each drawer will then be arranged in accordance with Mr. Galton's method, that is, following the alphabetical order of the formulæ. Instructions for determining the formulæ and for arranging the cards will be found in Appendix G.

At first there will be only one cabinet for all adult male criminals, but it will soon become necessary to form a separate one for older men, say for persons born before the year 1830. The age of criminals is often wrongly given, and it would be necessary at first to search this cabinet in all cases of persons apparently above 50 who may not be found in the ordinary cabinet, but such searches would become gradually rarer as the older convicts die out, and ultimately all the older cases would be eliminated.

The separate cabinet for older criminals will be required, even if the deaths of all habitual criminals, so far as known to the police and prison authorities, are reported from time to time to the registrar, and their cards withdrawn from the registers. We strongly recommend that the police should be called on to report all such deaths known to them, and that in other ways efforts should be made to reduce the bulk of

* The margin at the bottom of the card is part of a contrivance designed by Mr. Galton to check mechanically the sorting of the cards and described in Appendix H.

the records; but, even when the utmost has been done in this direction, there will remain so many cases where old offenders disappear or die unrecognised, that unless there is a separate classification for the older cases, the registers would, in the course of years, become seriously encumbered with a mass of obsolete and useless records.

There will be a separate cabinet for women, but as the numbers are smaller the arrangement would be simpler and the fifth measurement may be omitted so far as the classification is concerned.

As regards boys and lads whose bones have not attained their full growth, it may be best to measure and classify them separately as is done by M. Bertillon, and to allow for growth in the search for the card. We are disposed, however, to recommend as an experiment that for this class, which is small compared with the number of adults, a separate index based entirely on Mr. Galton's method might be formed.

The Register having thus been constituted, it will be necessary, before it can be used to discover the antecedents of unknown offenders charged with crime, that rules to authorise the measuring and photographing of untried prisoners should be made by the Secretary of State under section 8 of the Penal Servitude Act, 1891. On this subject a recommendation is made below in accordance with the reference to the Committee. Assuming the rules to be made, the steps in each case will be as follows: When the antecedents of a prisoner charged with crime are unknown and it is suspected that he is an old offender, the police will apply to the magistrate at the first hearing of the case to make an order for the accused to be measured and photographed, and the magistrate, if satisfied that it is a proper case, will, on remanding the prisoner or committing him for trial, make an order for that purpose. On reception in prison the prison authorities, acting on the magistrate's order, will take the measurements, finger prints, description and photograph of the accused in the same way as in the case of habitual criminals about to be discharged, and they will be noted on an inquiry card similar to that already described but distinguished from it by a difference of colour. This will be forwarded to the registrar. On its receipt search will first be made in the alphabetical register under the name given by the prisoner, and if he should have given the name of a person previously convicted, the identity can at once be proved or disproved by the measurements, finger prints and photograph. If he is not found by means of his name, search will be made in the Index Register. If the case is found, information will be given to the police who have charge of the case, of the prisoner's previous convictions, and of the means by which his identity can be established. If the case is not found after adequate search—a sufficient margin for errors in the measurements being allowed—it will be practically certain that he is not an habitual criminal within the class included in the register, and information to this effect may be given to the police.

We do not anticipate that the adoption of this system will increase materially the number of prisoners detained in prison on remand. It is already the practice to remand prisoners suspected of being old offenders for at least one week, often for several successive weeks, for purposes of inquiry. Under the new system the number remanded for one week might be somewhat increased, but this would probably be more than counter-balanced by the smaller number who would be remanded more than once, as the search in the register would in every case be completed within the first week.

Nor do we anticipate that any serious difficulty would arise from resistance on the part of prisoners to measurement or any other process which may lead to identification. It has been stated in evidence that prisoners have in some cases resisted being photographed, but the number who do so is not large, and they usually base their resistance on the ground that they cannot legally be required to submit. If it is once made clear to them that the rules are enforced under statutory powers, the cases of resistance would, we believe, become extremely rare. This is the view of all the Governors and other persons experienced in the management of prisoners whom we have consulted. In the last resort the measurements and finger prints could, we are satisfied, be taken even when active resistance is offered by the prisoner. Resistance to measurement would interfere less with the process and could be more easily overcome than resistance to photography; and, as regards the finger prints, an ingenious mechanical contrivance has been suggested by Mr. Galton for taking the finger-prints of a recalcitrant prisoner, though we do not think it will be necessary to have recourse to this.

A point of some importance is whether the proposed Anthropometric Registry is to be connected with the Habitual Criminals Register in the Home Office or with the Convict Office at New Scotland Yard. In many respects it connects itself naturally with the Habitual Criminals Register; but it appears to us that there are great practical advantages in favour of the work being done at Scotland Yard. If

placed in Scotland Yard, it would be in the hands of officers actually engaged in the work of detecting offenders, experienced in all branches of police work and having a keen interest in securing the utmost possible efficiency in the working of the Register. At Scotland Yard the assistants to be employed in the work would be selected from a force of 15,000 men, and any assistant found on trial not to have the special aptitude for this particular work could be withdrawn to other duties. The identification of offenders is primarily police work, and though the measurements and finger marks should be taken in prison and by prison officers, their use in the work of identification will be best in the hands of the police. The peculiar character of the Metropolitan Police, who are at once a local police force for London, and an imperial police under the control of the Government, particularly fits them for undertaking a work which will be specially useful in London, but whose main feature is that it will enable travelling criminals to be traced and identified in whatever part of the country they may attempt to begin a new course of crime. Ultimately it may be found convenient to transfer the existing Habitual Criminals Register to New Scotland Yard, but we do not think this should be done until the new Register is in full working order.

A word must also be said as to the cost of the new system. At its first introduction it must inevitably involve some expense, but this, as we shall show, will be much smaller than might be supposed, and we confidently anticipate that it will gradually supersede the existing method of identification and in the long run effect a considerable economy. In the meantime the additional cost will fall under two heads, the cost of taking the measurements in the prisons and the cost of keeping the Register at New Scotland Yard.

As regards the former, the number of convicts and habitual criminals to be measured, &c. before discharge will, judging from the numbers entered in the Habitual Criminals Register in recent years, be about 4,000, or say for safety, 4,500. It is impossible to say how many unconvicted prisoners will have to be measured, &c. while on remand or waiting trial, but if we take the same number, 4,500, it will, we think, be a liberal allowance. We may assume therefore 9,000 prisoners, convicted or unconvicted, to be measured and to have their finger prints taken in the year. In M. Bertillon's office, the measuring, taking of marks, &c., occupies two clerks on the average rather less than 10 minutes. As it is proposed not to take so many measurements in England, we may perhaps safely assume that the time spent will not be more, and if we may add five minutes for the finger prints—a skilled operator can take the complete finger prints in duplicate in two minutes—we have then 9,000 measurements to take, each occupying two warders for 15 minutes,—that is, occupying two warders for 2,250 hours, or for 281 days of eight hours in the year. If therefore all the prisoners were concentrated in one prison the whole work could be done by two additional warders. The work will, of course, be distributed over 63 prisons, and the arrangements to be made for its performance will be a matter of prison administration not more difficult than those involved in any slight increase of prison work. It will be for the prison authorities to decide whether it can all be done by the existing staff,—it is proposed that the measurements, &c. should be taken in the morning when the reception officers have usually comparatively little to do—or whether in one or two central prisons an addition to the staff will be necessary. In the end, it may fairly be anticipated that the work of measurement and of taking finger prints will occupy even less time than the present laborious method of taking distinctive marks which occupies from seven to ten minutes and sometimes longer.

There will, it should be added, be one or two minor items of expenditure in introducing the new system in the prisons, particularly the cost of instruments for use in each prison, that of taking some additional photographs of untried prisoners, and the expense of bringing warders for a few weeks to London to learn the methods of measurement, &c. For the latter purpose it will probably be well to establish for a time at Pentonville, where the larger number of convicts and habitual criminals are discharged, a sort of school where selected warders from country prisons may be given the necessary training.

As regards the Central Registry, we can best estimate the cost by a comparison with M. Bertillon's office. He employs eight assistants, who in the morning take measurements and in the afternoon attend to the registers and make searches. The work of the registry therefore (as distinguished from the measuring) only occupies the time of four men, or of five if M. Bertillon himself be included. But M. Bertillon now receives and classifies in each year about 15,000 measurements from Paris and about 70,000 from the departments. In the English registry it is proposed to limit the cases to be entered on the registry to about 4,000 or 4,500 in the year. It seems, therefore,

safe to say that for some time at least one or two men will be able to do all the work of the Central Registry. This increase will appear very small when it is borne in mind that, since the Convict Office undertook in 1889 the extra work of registering the habitual criminals discharged in the Metropolis, the staff has been increased by six officers, four men having been added for this purpose in 1889 and two in 1892; and it is understood that in order to maintain this work, a further increase of staff is now considered necessary.*

In addition to this we are strongly of opinion that it is essential to the complete success of the registry to secure, at all events at the outset, the services of an expert practised in the methods of scientific anthropometry, and if possible one who has had practice in training other persons in making scientific measurements. We have the utmost confidence in the skill and ability of the officers in the Convict Supervision Office, and we think it might be possible, by sending two or three intelligent officers to learn the system at Paris in M. Bertillon's office, to secure the necessary knowledge and training to start the new system, if we are content to follow strictly on his lines. But we feel sure that it would be better that the Convict Office should have from the first the assistance and guidance of a scientific adviser in England. He would be able from the outset to settle such questions as the limits to be adopted in England for the classes of large, medium and small (as already mentioned, the Anthropological Institute have data available for this purpose), he would be able to superintend the training of warders in taking measurements, and he would instruct the officer in charge of the registry in the decipherment and classification of finger prints.† Moreover, when practical experience had been obtained of the use of the finger prints, he would be able to revise the suggestions which we have made as to the respective place of the Bertillon and the Galton methods in the system, and might possibly find it advantageous to extend the Galton method of classification further than, with the limited experience we possess of its practical application, we have ventured to propose. On every ground therefore we think it desirable that the English Anthropometric Office should from the first have the advantage of scientific guidance not inferior to that which the French Service d'Identification enjoys in having M. Bertillon at its head.

IV. WHAT RULES SHOULD BE MADE UNDER SECTION 8 OF THE PENAL SERVITUDE ACT, 1891, FOR PHOTOGRAPHING AND MEASURING PRISONERS.

Our recommendations under this head have to some extent been anticipated. The section in question was introduced into the Act of 1891 to remove doubts as to the power to photograph and measure *untried* prisoners; but a promise was given that the rules, which have to be laid before Parliament, would contain safeguards against the indiscriminate photographing of untried prisoners whose antecedents might be well known. The safeguards we suggest are (1) that an untried prisoner should be measured and photographed only on the order of a magistrate; (2) that this order should be made on reasonable ground being shown for suspecting that the prisoner is an old offender. We therefore make the following recommendations:—

1. *As regards convicted prisoners.*—We recommend that the Rules should provide that—

(1.) all convicts and all persons coming within section 7 of the Prevention of Crime Act, 1871, should before release be *photographed*, the photograph to show both the full face and the side face, but not the hands;

(2.) That in each case the following measurements should be taken:—Length of head, width of head, length of left middle finger, length of left forearm, length of left foot and the height; the first five measurements to be taken in millimetres, the height in feet and inches;

(3.) That in each case impressions should be taken of the tips of the ten fingers giving the measurements of the papillary ridges;

(4.) That the position and size of distinctive marks on the head, limbs, and body should be ascertained by measurement in the following order:—I. Left arm and hand; II. Right arm and hand; III. Face and throat; IV. Chest; V. Back; VI. The rest of the body (prominent features only).

* In a memorandum on the work of the Convict Supervision Branch, recently submitted to the Secretary of State, Mr. Anderson says:—"The scheme imposes a large amount of extra work in my Department, and the time has now arrived when we must go forward with a stronger staff, or else draw back."

† Another question on which scientific advice as well as practical experience is required is that raised by Professor Thomson and alluded to in the note on page 23, namely, the amount of variation to be allowed for in dealing with each measurement.

Only clearly distinctive marks should be taken. If sufficient marks are found in I. II. and III., the others should not be taken.

2. *As regards prisoners received on remand or for trial.*—The Rules would be similar but restricted to persons accused of crime or charged under the Vagrancy Act, for whose measurement an order is given either by the magistrate by whom they are remanded or committed, by a member of the Visiting Committee of the Prison, or by a Prison Commissioner, such order to be made on an application by the prosecutor or by the police, on the ground that prisoner's history is unknown, or that he has no permanent abode, and that from the character of the offence with which he is charged or from any other cause there is reasonable ground for suspecting that he may have been previously convicted or may be habitually engaged in crime.

In the case of untried prisoners the photograph, measurement, &c., should be taken not later than noon on the day after reception; and the card with the measurements and photograph should be forwarded the same or at latest the following day to the Central Registry.

The rules should also provide (in accordance with a pledge given in Committee on the Penal Servitude Bill) that photographs taken before trial should be destroyed if the prisoner is afterwards acquitted.

In conclusion, we have only to say that the method of identification which we have recommended, or any other scientific method that may be adopted, must not be expected to produce its full results until after a considerable time. When it has been several years in operation, when the warders employed to make the measurements have acquired experience and skill, and when a large mass of records has accumulated, then, and not till then, is it likely to work as smoothly and to produce results at least as satisfactory as those obtained by M. Bertillon in France. Even in France, though Bertillonage is now in full operation in Paris, its application to the country as a whole is still, as we have said, incomplete. The success of a similar system in England can come only with time, and by means of the hearty co-operation of all concerned in its working. We may confidently anticipate that, if fairly tried, it will show very satisfactory results within a few years in the Metropolis, but the success of its application to the country generally will depend on the voluntary co-operation of the independent county and borough police forces. This we feel sure will not be withheld; when the principles of the system are understood and its usefulness appreciated, we believe it will not only save much time and labour to the police in the performance of an important duty, but will give them material assistance in tracing and detecting the antecedents of the guilty, and will afford, so far as its scope extends, an absolute safeguard to the innocent.

We trust that when the system is to some extent established in England, it may speedily be extended to Scotland and to Ireland:

We have the honour to be,

Sir,

Your obedient Servants,

C. E. TROUP.

ARTHUR GRIFFITHS.

MELVILLE L. MACNAGHTEN.

H. B. SIMPSON,

12th February 1894.

LIST OF WITNESSES.

	Page
Chief Inspector NEAME, Metropolitan Police	38
Inspector REEVE, Doncaster Police	40
Mr. WEBB, Chief Constable, Leeds Police	41
Mr. WITHERS, Chief Constable, Bradford Police	42
Hon. Captain ANSON, Chief Constable of Staffordshire	42
Mr. VAN HELDEN, Birmingham Police	42
Mr. EDWIN COATHUPE, Chief Constable, Bristol Police	45
Captain SHOWERS, Chief Constable of Essex	46
Inspector ROBERTSON, Liverpool Police	47
WAKEFIELD PRISON OFFICERS	40
LEEDS PRISON OFFICERS	41
Mr. J. B. MANNING, Governor of Pentonville Prison	44
Sir R. E. WEBSTER, Q.C., M.P.	48
Mr. FRANCIS GALTON, F.R.S.	56
Dr. J. G. GARSON	50
Professor ARTHUR THOMSON	64
Mr. E. R. SPEARMAN	61
Mr. C. S. MURDOCH, C.B., Home Office	63
Mr. A. S. LEWIS, Office of the Director of Public Prosecutions	60
Mr. CECIL DOUGLAS, Mansion House Police Court	45
Mr. J. G. GRACE, Habitual Criminals Registry	42
Letter from Sir WILLIAM FLOWER, K.C.B., F.R.S.	56

MINUTES OF EVIDENCE.

THE following Minutes represent only a very small part of the Evidence taken by the Committee. They consist of brief notes taken by the Chairman and Secretary of statements made during the visits of the Committee to police offices and prisons outside London, and of a shorthand report of the evidence heard at the Home Office. The report of the evidence heard on the 11th, 17th, and 18th November is much condensed. In the greater part of the inquiry, consisting of informal conversation, examination of books and photographs, and inspection of the process of measurement, photography, &c. in actual operation, it was impossible to take any formal record of the evidence.

Home Office, 11th November 1893.

Chief Inspector NEAME, Metropolitan Police.

(Chairman.) The Committee wish to ask you some questions to supplement the information you gave us when we visited your office last Thursday. You have looked up the cases mentioned in Mr. Simpson's memorandum?—Yes.

Take first the case of George Twohigg, who was sentenced to imprisonment at the Middlesex Sessions in 1882; he was afterwards convicted summarily at Worship Street Police Court in the name of George Smith. Was his previous conviction then known?—On reference to the papers I find that his previous conviction was reported to the magistrate, who preferred, however, to deal with the case summarily. The previous convictions did not come before him in evidence.

Then there is the case of Henry Austin who was discharged as a licence-holder, in October 1891, under a sentence of penal servitude. Shortly afterwards he was convicted summarily at Clerkenwell Police Court for stealing a watch. Was his previous conviction known?—No; he appears to have escaped identification.

Will you now state, in order, the steps taken to trace an unknown offender in your office. Assume that you have under arrest a person strongly suspected to be an habitual criminal, but not identified. What steps would you take?—After receiving his description and photograph, the first step would be to search for his name in the alphabetical registers.

That search would not take long?—Not very long, perhaps 10 minutes.

It is not likely that you would identify him by the name; what, then, would be the next search?—The next search would be in the register of distinctive marks. That register is classified according to the different parts of the body on which the marks occur, the marks of each part being arranged in columns. If the person searched for has distinctive marks on six parts of his body, it might be necessary to make searches in six different divisions of the volume.

That would occupy some time?—Yes; it might be a long search. We have also a register of tattoo initials and names; that is indexed alphabetically, and if one of the marks was a tattoo name, the search would not occupy long.

Supposing this failed, where would you search next?—The third step would be to search the register of names classified according to crime. Certain special crimes are selected, and persons who habitually commit them are classified accordingly.

And if this failed what would be the next step?—Then we should try the albums of photographs.

How many of them have you?—14 albums containing on the average 5,000 photographs each and a library of 90 volumes, dating from 1864, each containing 500 photographs and complete descriptions.

You would first search the more recent volumes which are classified, I understand, according to the height of the persons?—Yes.

Suppose your man was 5 ft. 6 in. high. You would first search for him in that division?—A margin would be allowed for error.

You would search also, I suppose, among 5 ft. 7 in. and 5 ft. 5 in.?—Yes, and we should search also among those 5 ft. 8 in. and 5 ft. 4 in.; there might be an error in either direction of 2 inches.

If he were not found in the classified albums, you would next have recourse to the older volumes where the photographs are arranged merely in chronological order?—Yes. We should have to search right through these.

And would you use Sir Edmund Du Cane's Registers of Habitual Criminals?—We might do so, but they are seldom used. They are somewhat too complicated for Metropolitan police officers.

So that to find one man, you might have to make five or six distinct searches?—Yes.

And that would occupy some time?—Yes.

Would an hour be too long for a search?—No. An hour would not be an unusual time to spend in searching for a "good" criminal; we have much longer searches than that. Our men would search for days rather than lose a "good" man.

So that if some other system were added to those you now use, either the Bertillon method or the fingerprint method or some other method, even if it did not lessen the process, it would not imply a very great addition to your labour. It would only be a seventh search added to the six others?—Yes. That is so, but there would be the labour of collecting and classifying the cards.

That is not what we are at now. We are speaking only of the searches. A seventh search added to the sixth now made would not be a disproportionate increase?—No, I think not; but I do not know the Bertillon system sufficiently to be able to offer an opinion.

Now, I want to ask you about some improvements in the existing system that have been suggested. First, about the photographs. Do you have all the photographs you want?—When convicts are discharged we receive three or four photographs, but we can always obtain as many more as we want by paying at the rate of 2d. each.

When prisoners are discharged from local prison?—Then we have to pay for the photographs at a higher rate, varying at different prisons. When we wish to have a large number of these, we have them copied by the London Stereoscopic Company; they do it better, and more cheaply than it is done at the local prisons.

Are the prison photographs not good ones?—There has been a great improvement in the photographs of

convict prisons, those from Portland and Dartmoor being especially good.

Do you require more photographs than you now have for route-inquiry forms while prisoners are under remand?—We very rarely issue route-inquiry forms, only perhaps four or five times in a year. When we do so, we usually can obtain photographs without difficulty.

Then what improvements would you suggest?—I would suggest that the photographs should be printed without the hands. I think it is the experience of all officers much engaged in searching the albums that the hands distract the attention, and make the recognition of faces slower and more liable to error.

But are not the hands sometimes useful?—If a finger or thumb has been lost or injured, it may be the means of identifying him, but that is always included among the distinctive marks. The photographs of the hands are not required.

Then as to the forms supplied to the police when convicts are discharged. There are several different forms which seem to contain the same particulars and photographs but differently arranged. Do you require these?—No. We do not know the reason for it. So far as the police are concerned, it would be better that the arrangement should be the same in all cases. It would be best to have the photograph always at the top. Placed below on the right-hand side it is often folded, and then it is more difficult to use.

NOTE.—Mr. Neame, since giving oral evidence, has supplied the Committee with the following statement:—

The number of persons registered in this office who have been charged with fresh offences in the Metropolitan Police District during the year 1893 is 2,149, made up as follows:—

License holders, supervisees, and ex-pirées	£60
Other registered criminals	1,289
	<u>2,149</u>

The "other registered criminals" are mostly habitual criminals within the 7th section, but not all. A good many other cases are registered of persons believed to be habitual criminals but who have not yet come technically within the section.

It may be useful to state what is done by my officers to obtain personal knowledge of convicts and others. As regards convicts who are about to be liberated from prison on license or supervision or on expiration of sentence, a certain number of trained officers (three or four) from this office visit Pentonville Prison every Wednesday to inspect them prior to release for the purpose of getting a knowledge of their features and marks, &c., so as to be able to recognise them again if they should be taken into custody for fresh offences.

The convicts' marks are compared with the descriptive forms furnished by Prison Governors, and corrected where necessary, and the men are told to report at the Convict Supervision Office on liberation.

When they come to the Convict Supervision Office they are required to give an address and directed where to report in future.

The same officers, if possible who saw them at Pentonville see them at the Convict Supervision Office and again visit them very quietly at their registered addresses for the purpose of verification.

Thus these officers have three good opportunities of observing the features of the men, and this system has proved most useful as regards identifications.

It has operated so beneficially that I have suggested its application to the persons who have been sentenced to police supervision under the 8th section and who are subject to the same regulations as to reporting as license holders, so that the officers might be allowed to see these supervisees at a local prison prior to their discharge in the same manner as the convicts at Pentonville.

One or more of these officers attend the remand prison three times a week with divisional officers.

Then with regard to distinctive marks, have you any improvement to suggest in the mode of registration?—I think it would be better if the position were more definitely fixed. Such an entry as "Scars on back and shoulders" is of no use; but it would help to establish the identity if the distance of the marks from particular points were definitely fixed. The body should be divided into sections, and the marks in the different sections measured from particular points.

But would not these increase very much the size of the list?—It would be better to have fewer marks and these marks more definitely fixed. A few distinct marks are better than a large number of vague ones—the marks on the face, hands, and arms are the most useful and the most easily seen.

But are not some of the marks on the hands common to many persons. Look at Sir E. Du Cane's Distinctive Marks Register, "Left hand, tattoo marks, ring on second finger." In the volume for 1892 there are 28 persons who have this mark, and only three of them have any other noted. If you had a prisoner with this mark you would have to search the records of these 25 and probably as many others in previous volumes?—Yes. In our register we should probably have other marks arranged in parallel columns.

You don't use this register much?—No. We do not use the Register of Distinctive Marks often.

MEMORANDUM OF WORK done at the CONVICT SUPERVISION OFFICE, NEW SCOTLAND YARD.

Search forms received from divisions during March 1893.	1,251	Daily average (27 days), 50.
Identified	175	Daily average (27 days), 6.
Route-inquiry forms received from provincial police during March 1893.	55	Daily average (27 days), 2.
Identified	12	(Proportion 1 in 5.)

On the 1st day of March, 1893, 21 officers attended to search for 27 prisoners, taking in all 5½ hours to search: resulting in 7 identifications.

Number of photographic albums in use, 14.

P. NEAME.
Chief Inspector.

COMPARATIVE TABLE, showing work performed in the 7th Section Branch of the Convict Supervision Office for the years 1890-1-2-3.

Nature of Work.	Year.			
	1893.	1892.	1891.	1890.
No. of license holders and supervisees registered.	1,495	1,840	1,626	1,838
No. of other criminals registered.	1,286	1,938	2,144	1,226
No. of persons photographed	*1,086	1,321	†1,800	1,332
No. of attendances at C.S.O. to search records.	4,853	4,001	2,617	1,044
No. of search forms received from divisions.	13,140	5,582	2,665	—
No. of identifications from records.	‡2,124	‡1,265	533	176
No. of route-forms received and dealt with.	722	539	462	—

P. NEAME.
Chief Inspector.

* This number is now believed to be normal, and it is not anticipated that there will be any considerable annual increase in future.

† As it was thought that too many photographs were being applied for in 1892 the number was limited to "7th Sec." cases, and to any other cases considered of special or extraordinary interest.—M. L. M. 13/11/93.

‡ Includes identifications for Provincial Police Forces from route-inquiry forms; for 1893, 99; for 1892, 61.

Wakefield, 14th November 1893.

Mr. EMMETT, Commitment Clerk, Wakefield Prison.

Remand prisoners are rarely photographed. If this could be done it would be a great help in identification. They would submit quietly if they knew it to be the rule.

Most prisoners admit previous convictions.

Route-forms with photographs are sent out by county police. They ceased to be sent from prison when the order forbidding the use of force in photographing was issued.

Lists of previous convictions are sent in by police along with prisoners if they know them.

The prisoners for trial are mostly local. There are a few "foreigners," travelling pickpockets, and burglars. Of trial prisoners I should say about 10 or 15 per

cent. are travellers, and, perhaps, 2 or 3 per cent., or 20 in the year escape identification. If route-forms could be sent out, these would probably be traced. Route-forms are only sent out to ascertain whether suspected previous convictions can be verified. They are mostly north-country men; there are few Londoners, except at the races.

Some are traced by means of their letters.

Measurements are not of much use in tracing old offenders; marks are very useful *if prominent*. If you bring forward clear evidence of who a man is, he will almost always admit it.

The Register of Habitual Criminals is used if there are prominent marks.

Mr. BENJAMIN JOHNSON, Warder, Wakefield Prison.

I am reception warder at Wakefield Prison. I have held that office for four years. I am employed until 6 p.m. three nights in the week, until 8 p.m. one night, and until 10 p.m. two nights.

I see, practically, all the prisoners received. I know many by sight. There are some strangers; more this year than before.

There are more colliers in prison this year owing to the strike.

The average time occupied with each prisoner is eight or ten minutes; it usually requires about five

minutes to take the marks; but sometimes if they are numerous it takes much longer.

The "foreigners" are not very numerous; they are brought chiefly from Doncaster. I can sometimes distinguish them as "foreigners" by accent.

In this prison we have many cripples—men injured in mines or by machinery; these are easily known.

Tattoo marks are sometimes defaced; usually they are scorched in order to obliterate them.

PAPER handed in by the CHIEF WARDER IN CHARGE, WAKEFIELD PRISON.

RETURN of PRISONERS committed to Her Majesty's Prison, Wakefield, for Trial at the Leeds Summer Assizes, 1893, and the West Riding, Sheffield City, and Doncaster Borough Michaelmas General Quarter Sessions, 1893.

1. Local prisoners and fully known as such -	-	-	-	-	-	-	-	-	-	55
2. Number of prisoners sentenced as first offenders	-	-	-	-	-	-	-	-	-	18
3. Number of prisoners who are strangers and travelling criminals	-	-	-	-	-	-	-	-	-	16

Total number of prisoners committed - 89

4. Number of class (3) against whom nothing had been found at the time of trial	-	-	-	-	-	-	-	-	-	1
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JNO. HARRISON,
Chief Warder in Charge.

Her Majesty's Prison, Wakefield,
15th November 1893.

Dr. CLARKE, Medical Officer, Wakefield Prison.

Some years ago I made a study of cranial measurements.

Head measurements increase up to 50 years of age.

In a paper on cranial measurements contributed in 1876 to the West Riding Lunatic Asylum Medical Reports I gave the following figures as a result of the measurement of 500 prisoners:—

Ages.	Diameters of Head.		Circumferences.	
	Anterior Posterior.	Transverse.	Whole.	Frontal.
Under 20 -	7·397	6·127	21·700	10·477
20 to 30 -	7·589	6·316	21·992	10·791
30 to 40 -	7·651	6·150	22·132	10·764
40 to 50 -	7·674	6·264	22·172	10·797
50 to 60 -	7·541	6·105	21·822	10·661
60 to 70 -	7·531	6·237	22·137	10·787

The number of prisoners of the later ages was small compared with those of middle life, and it would, therefore, not be safe to draw a conclusion from the figures relating to prisoners above 50.

The measurement of height is very uncertain. I have just compared the heights of 32 convicts transferred from other prisons as they were recorded in the prison they came from and as taken here. In 15 cases the heights were the same. In 17 they differed.

The difference was:—

$\frac{1}{4}$ inch in 10 cases.

$\frac{1}{2}$ " 4 "

$\frac{3}{4}$ " 1 case.

1 " 1 "

1 $\frac{1}{2}$ " 1 "

Prisoners could alter their finger-marks only by making a scar, which would itself be a distinguishing mark.

Inspector HARRY REEVE, Doncaster Borough Police.

We have in Doncaster a considerable number of criminals who come from other districts. These we endeavour to identify by issuing route-forms.

In 1892 we had 46 foreigners, including 14 in the race week. All these we "routed." There were other trivial cases not routed. Of the 46 the majority were identified; mostly by officers of other police forces.

In one case (January 1893) routes were sent to between 80 and 100 towns. In one only was the criminal known, viz., in Swansea, where he had had convictions of obtaining by false pretences. He was not in the Register of Habitual Criminals.

Photographs are taken at Doncaster in the Police Office yard.

Old thieves sometimes object to be photographed.

They would not, in my opinion, object if a rule were made requiring untried prisoners to be photographed. We have 300 or 400 prisoners in custody in the year.

Magistrates are always ready to remand for inquiry. If it were in their discretion to order photographs to be taken, they would make no difficulty.

This year, in the race week 16 persons were summarily convicted no previous convictions being known, but are now believed to be old offenders. The Governor of Wakefield Prison has been asked to supply photographs. One of the 16 has been already traced.

Distinctive marks are not of use for identification unless prominent. In one case an old offender traced by a scar on each hip. He was traced in Habitual Criminals Register. It required several hours' search before he was found.

The Habitual Criminals Register is useful.

The last quinquennial volume is most used, and after that the annual volumes.

I suggest that there should be district registries because the information supplied by the Habitual Criminals Registry is often defective. In a recent case while prisoner was awaiting trial we obtained form R. from Habitual Criminals Registry, but several more recent convictions were not given. This was the case of Thomas Howard or Holt, sentenced to 15 months at last Doncaster Borough Sessions.

The omitted convictions were summary cases.

I could, if required, report to Habitual Criminals Registry deaths of local habitual criminals out of gaol, as the police would usually know of them through inquests or otherwise.

Habitual Criminals Register arrives very late; it would be much more useful if received in March. I think monthly or quarterly publication would be useful.

A year or two ago a man (Pearman, *alias* Thomas) was arrested at the races; he could not be identified.

After conviction a photograph was sent to Scotland Yard but was not recognised. It was afterwards recognised in London by a warder. The man was a London thief, and was at the time on licence and wanted at Scotland Yard for failing to report himself.

If prisoners were photographed in prison on remand, we should wish photographs taken in prisoners' own clothing. It is easier to recognise them in their own clothes than in prison dress.

If suggested district registries were established, recognition would be from one photograph to another. We often recognise photographs sent us from photographs in our books.

At Doncaster a register is kept of men arrested by police, with their marks, &c.; but after an interval of five years a man would probably escape recognition unless well known.

Leeds, 15th November 1893.

Mr. F. T. WEBB, Chief Constable, Leeds Borough Police.

The Criminal Register is seldom referred to. I frequently send descriptions to Criminal Registry Office, but they rarely find the man.

In one case, where the chief mark was a scar on the forehead they sent us two photographs to compare, but neither was right. He was afterwards recognised by a detective from Manchester. His name was in Dis-

tinctive Marks Register 1894. Several pages are covered by names of persons with scar on forehead; it is not really a distinctive mark. Photographs are of immense use. We photograph every one charged with serious crime, both local persons and strangers. Descriptions without photographs are useless.

Major LANE, Governor of Leeds Prison.

The bulk of old offenders are identified by route-forms, but route-forms are useless without photographs.

Photographing of all remand prisoners, more particularly those committed for trial, would be most useful.

In a case last week, a route-form came from Wakefield Prison giving description of young fellow for trial who stated he had been in Leeds Gaol lately, but gave a false name. It was returned marked "not known in that name." Photograph was sent next day and was recognised at once.

Habitual Criminals' Register is used; three copies are in use in prison. Not many identifications are got by means of it.

Leeds and Bradford prisoners usually photographed by the police. County cases are not often. Prisoners under remand sometimes object to be photographed, but when they do, snap shots can often be taken.

All habitual criminals are photographed before discharge, some in their own clothes, others in prison dress. The photographs are taken by an outside photographer. They are very good photographs.

Mr. W. POPPLETON, Assistant Warder, Leeds Prison.

I was reception warder at Wakefield for several years. I took distinctive marks of prisoners on reception. In *felony* cases the marks are taken on reception on remand; the marks revised before Form R. is sent to Habitual Criminal Registry at expiration of sentence.

Of our prisoners, nine out of ten are local men and known to me.

The taking of particulars, marks, &c., occupies about seven minutes. I can take about eight an hour. In some cases the time is much longer, when there are many tattoo marks.

Since circular of distinctive marks not taken in minor cases, such as persons committed for drunkenness or begging, &c., or on bastardy orders.

Tattoo marks are sometimes defaced. I know one case where a prisoner had letter D on left breast; it is now made into mermaid. This is sometimes done to prevent recognition in prison. Sometimes the tattoo is removed, but a flesh mark of same shape left.

I suggest that an experienced warder should go round other prisons in the district to detect old offenders on remand. A warder goes to Wakefield, but not elsewhere.

Mr. TAYLOR, Chief Warder, Leeds Prison.

I have been warder at Wakefield, Scarborough, Southwell, Northallerton, and Leeds. Good many old offenders escape. More since the photographing of remand prisoners in prison was discontinued. I think about one-third of trial prisoners are strangers—pick-pockets, burglars, travelling thieves. They are routed both by prison and police, but the prison routes are without photographs, and we do not get many results. The distinctive marks are not sufficient.

The Habitual Criminals' Register used, but rarely gives results. There are too many names. The marks are not sufficiently distinctive. "Scar on forehead" would be no guide whatever.

Warders from Wakefield come here before assizes and sessions, and two warders from here similarly visit Wakefield. Visits from warders from Manchester, &c., would be useful.

Bradford, 15th November 1893.

Mr. WITHERS, Chief Constable, Bradford Borough Police.

We take photographs in all cases. The Convict Prisons' photographs very bad. They should be better, and there should be two of each convict, one with beard and one without. The head ought to be bigger. Magistrates would order photographs to be taken if they had the power.

About one-half of our trial prisoners are strangers—travelling thieves, &c. There are very few from London. They are mostly north-country men.

Birmingham, 16th November 1893.

Hon. CAPTAIN ANSON, Chief Constable of Staffordshire.

Photographs of untried prisoners would be of much use. It would be better to take them in prison than in police cells. They would be much better done in prison than by the police of county districts.

Generally speaking, Scotland Yard not so successful in giving help as might be expected. They sometimes fail to recognise London men.

Warders do not recognise so many prisoners as formerly. They are less interested in the work.

More identifications of strangers are required in cases of obtaining by false pretences than in any other class of crime in proportion to the number of cases of each class.

Thomas Tattersall was three times sentenced to five years' penal servitude for larceny and for obtaining by false pretences, the last of the three convictions being in October 1889. Within four years of his last sentence, viz., in October 1893, he was again convicted of the same offence for which his unexpired sentence of five years was awarded, and got only 12 months from the same chairman who passed last sentence of five years. There was no distinction as to the offence in each case—several charges of obtaining by false pretences.

[Two other similar cases specially mentioned to show the comparative uselessness of proving previous convictions.]

Mr. G. VAN HELDEN, Chief Inspector, Birmingham City Police.

The criminals we have to deal with are mostly local, but there is a considerable number of "foreign" thieves. We have pickpockets from London and elsewhere. In one recent case of a notorious burglar released to Bristol on licence under a 10 years' sentence was arrested in Birmingham for failure to report. Thieves on the way from London to Manchester, Liverpool, &c., frequently make a stop at Birmingham. On the other hand, we have Birmingham thieves who carry on their work in the adjoining counties, and only bring their goods for disposal in Birmingham.

So far as Birmingham criminals are concerned, we have little difficulty. They are known personally and we have carefully-kept records. The special feature of our books are the carefully-made drawings of tattoo marks. When a person is arrested for crime who is unknown, but who is suspected to be an old offender from some other district, our first step is to search the groups of photographs from Scotland Yard. These are most useful. I should strongly urge that more should be issued, and at more frequent intervals. Failing them, we have recourse to the Habitual Criminals Register, with the Register of Distinctive Marks. These are often useful. The average time of a search

would be about three-quarters of an hour. If this fails, we would issue a route-form. These should have photographs attached. We get photographs as often as we can, but some prisoners refuse to sit. We cannot, as a rule, get photographs from the prison—the consent of the Commissioners has to be obtained and that takes too long. A prisoner was recently remanded for seven days, on the fifth the consent of the Commissioners was received and the photograph was then taken, but too late to be of any use. In that case the magistrates would not give more than one remand. I would strongly urge that prisoners on remand should be photographed on a magistrate's order. We do not get so much help from the prisons as we should have. If they do anything, they do it as a favour to us. In some cases the marks are useful; in one case, where a photograph had not been recognised by anyone, a copy was circulated of a tattoo mark which prisoner had on his arm. This was at once recognised by a Liverpool officer who had had the man in custody more than 10 years before. But as a rule, photographs are the main thing. My strongest recommendation is for greater facilities in photographing.

Home Office, 17th November 1893.

Mr. J. G. GRACE.

(Chairman.) You are the officer in charge of the Habitual Criminals Registry?—Yes.

How long have you held that position?—Since February 1884.

You also keep the General Register of Convicts, and are Home Office agent for discharged convicts?—Yes.

The Committee wish to ask you some questions to supplement the information as to the working of the Habitual Criminals Registry which you gave us when we visited your office last week. In the first place, we

asked you, I think, to find from the Convict Register for 1892 how many cases occurred in that year of convicts who had escaped identification at their trial being recognised after registration as men who had already been in penal servitude. Have you looked this out?—Yes. I have sent the list through the Prison Registry to Sir E. Ducane, who will send it to the Committee. The number of cases in the year ended 31st October last was seven, five of them cases of persons recognised when received under sentence of penal servitude, and two cases of persons summarily convicted and found to be license-holders.

Then have you ascertained how many inquiries you had from the police during the last three months, and what were the results?—Yes, I hand in a paper with the figures. In the three months there were 61 inquiries, and in 41 cases Form R was sent. In 23 of these cases identifications were reported.

Does the identification mean identifications by the distinctive marks?—Not in all cases. Sometimes the police send the name and ask for the photograph in order to see if they have the right man. Cases traced in this office by distinctive marks are not numerous. It is to be remembered that usually the police apply to us only when other sources of information fail. When they have searched the register themselves unsuccessfully, or have issued route-forms unsuccessfully, then they apply to us.

Now, as to the dates when the registers are issued, do you issue the copies to the police and to prisons?—No, that is done from Parkhurst Prison where they are printed. I cannot give the dates.

We have got them from the Prison Department; they are, 1891, Alphabetical Register, October 7th; Distinctive Marks, December 9th; 1892, July 25th and November 23rd; 1893, both Registers, September 9th to 15th. Are not these dates very late? If a prisoner was released in January 1892, his name did not appear in the published Register till September 1893?—Yes, after one year and eight months; that is the longest.

And if he was released in December 1892, there would still be an interval of about nine months?—Yes.

So the interval varies from 20 months to nine months?—Yes.

And in this interval a great many of them will be re-convicted?—A large number will be re-convicted before the register comes out.

Some will be identified by other means, some not identified at all; but the register gives no help in these cases?—That is so.

Can you suggest any way to meet this?—I think the registers should be published monthly.

But if that were done you could no longer have the alphabetical arrangement?—Yes, the monthly issue could be alphabetical, but I would suggest that there should also be an annual issue to supersede the monthly.

(Major Griffiths.) It could no longer be printed in the prison. It would take too much time—Yes, but I think, if issued monthly, it would be more useful to the police.

In the interval, before publication, some of the habitual criminals die, are their names omitted?—If they die in prison, their names are omitted. If out of prison, we do not know of the death. It would be an advantage if the police would report deaths to us. We cannot know of them.

(Chairman.) Now can you suggest any improvement in the arrangement of the Register of Distinctive Marks? Some of the marks are very indefinite—"scar" on forehead, for instance? That is not much of a distinctive mark?—No, but the register divides the forehead into sub-sections—"above right eyebrow," "right temple," &c., and it distinguishes cuts from burns, &c., and sometimes adds a side note as an additional guide.

Even so it is still very vague. At Leeds they told us of a case where the only mark was one scar on the forehead. They sent the description to you, and you sent down two photographs, but neither was right. Can you say how you selected these cases?—There are many pages in the Quinquennial Register under the heading "Head and face," "Scar—forehead"?—I cannot tell. As there was little to help us in the way of marks, we might perhaps have been guided by similarity of name.

(Major Griffiths.) Would it be better, if instead of dividing the Register by Head, Hands, &c., you took all the scars together, then all the birthmarks, and so on?—I think not so; it would only be one classification instead of another, and the present is better because the body is divided into sections and sub-sections, and you would only have to look at these

whatever the marks might be. Under each sub-section the marks themselves are also classified.

Are all scars entered in the Distinctive Marks Register?—No, the book would be useless if we did that. I would not enter a scar unless further defined—"large scar," "abscess," "burn," &c.

(Chairman.) But would it not be better to limit the number further and make them more distinctive?—Yes, I do this as far as I can. If it were a scar on the thigh, I would add "back" or "front," "inside" or "outside," as the case might be, and if this were not shown in Form R. when received from the prison, I would send it back with a query.

Do you think there should be more marks?—I believe not; they have the full record in the Alphabetical Register.

But would you not give greater detail—the direction of the scar or mark, and its distance from a fixed point?—It would be of greater assistance to have the direction and size or extent of the mark given.

How often are you successful in tracing cases by means of scars?—Not often; not one case in ten.

In the table you have given us, what does "no report" mean?—It means that we could send no information.

That is when you cannot identify the man?—Yes, cannot identify nor send a case for inspection.

Do you know when the information you supply leads to the identification of the man?—We are usually informed.

When route-forms are sent you, are they usually accompanied by photograph?—Yes, usually, but not always. Sometimes the prisoner refuses to be photographed, but that is quite exceptional.

Does the photograph help much?—It does not help us much in tracing the case as our photographs are not arranged in albums but affixed to the Forms R. When the case is traced, it confirms the identification. But the case has to be found by the marks.

Have you any other suggestions to make?—I would suggest that there should be two additional columns in Distinctive Marks Register, one giving date of birth, the other the height. It would be easier to find the right case, and would save looking up each case in the Alphabetical Register.

But can you get the age and height accurately?—Not accurately, but approximately. The additional column would eliminate cases obviously wrong and save much labour. If your man's age was given as 60, you would not look up cases under 45.

I may mention a case which occurred some time ago where I believe the prisoner could have been identified if his mark, a scar on the back of the left hand, had been closely defined. It was described on his discharge from Woking merely as a scar on back of left hand, and so was not entered in Distinctive Marks Register. If it had been closely described, in size and extent, it would have been used as a distinctive mark. When this man was afterwards in Wandsworth Prison his photograph was sent all round London, but not recognised, and this happened again 18 months later when he was in prison at Lewes, yet he had had a career of crime in London from his boyhood. He was at last recognised by a warder in Woking, and all his convictions were brought together. This was the case of Joseph Smith, alias Edmund Robinson. When in Wandsworth he was a ticket-of-leave man, and was no doubt on the books at Scotland Yard, and in the "Police Gazette," as wanted for failing to report.

(Mr. Macnaghten.) Was that case referred to the Convict Office?—Yes, it must have been; it went everywhere all round London.

(Chairman.) What do you wish to show by bringing forward this case?—That it would be better to define the marks very closely where permanent scars are concerned. If the exact size and exact location had been given, the scar in this case would have been a good distinctive mark, and probably have led to identification.

Do many escapes occur in London?—I think more old convicts escape recognition till after trial in London than elsewhere.

MEMORANDA as to POLICE ENQUIRIES made of the HABITUAL CRIMINAL REGISTRY during the months of August, September, and October, 1893.

Month.	Number of Enquiries.	Number of cases in which Forms R. were forwarded.	Number of cases in which Forms R. were not forwarded.	Number of identifications reported.	Number of cases in which Prisoners were not identified by the Forms R.	Number of cases not yet reported as settled.	Number of cases in which no report as to identification was made.
1893.							
August - - -	18	10	8	4	2	—	4
September - - -	23	16	7	9	5	2	—
October - - -	26	15	5	10	1	—	4

Mr. J. B. MANNING, Governor of Pentonville Prison.

(Chairman.) What is your experience as a Governor?—I have been Governor and Deputy Governor since 1859. I was Governor at Chester Castle in 1865, at Wakefield in 1882, and at Pentonville since 1890. I have also been connected with the police, and had charge of a section of the Cheshire Constabulary. Previously I was in the army.

What is your idea of the number of old criminals who escape identification?—I do not think that a large number escape recognition. Of course in Pentonville I have only convicted prisoners, not prisoners awaiting trial.

Do you think that any considerable number of persons who are convicted as new offenders are really old criminals?—Only a few. They sometimes escape, seldom more than once, but criminals generally hover round a certain district and are well known to the police.

But do you notice cases of London thieves going down to the country?—Generally to race meetings and large gatherings. The local police generally get assistance from the London police, and men who are caught are, as a rule, identified. They are remanded for inquiry, and information is obtained.

Do you receive many route-forms from the country?—A good many. Seldom a day passes but we get two or three. They are put in the Central Hall, and every officer looks at the photographs.

And are a considerable number identified?—A considerable number. We have a large collection of photographs. The men look at those and refresh their memories, and the confirmed criminals are likely to be found.

The route-forms come from country and not from the Metropolitan Police?—No, not from the Metropolitan Police. The Metropolitan Police attend at Holloway to make identifications. An officer from Pentonville also attends at Holloway three days a week.

Do you sometimes receive route-forms without photographs?—Frequently. These lead to identification very rarely; we look, if we have time, at marks given in Criminal Register, but we are not often successful.

Speaking generally, the photograph is the chief thing?—Yes, the chief thing; all the officers look at photographs.

Do not you find the Habitual Marks Register of very much use?—Yes, but it is a large volume, and it is published much in arrears.

Many are convicted before you get it?—Yes; the sooner you get it out, the better it would be.

Do you make much use of the "Police Gazette"?—Yes.

Do not you at Pentonville receive "lodgers" for discharge?—Yes; that is, convicts from other prisons to be discharged in London.

Are their distinctive marks taken?—No; not by us. The police come and see them and serve them with certain notices.

You take photographs of convicted men?—Yes, of people whose photographs are required by the police, and those against whom a previous conviction has been proved.

Are they taken by a clerk?—By a clerk who also photographs for Wormwood Scrubs.

Do they ever resist?—Not often. Refusal to have a photograph taken would be considered a suspicious sign and would be likely to lead to more inquiries. Some men when turned out into the yard are recognised by the others and this puts the officers on the track.

Do you think there would be much difficulty in photographing remand prisoners?—Not if there is an authority for it. In making rules for Chester Castle while it was a county prison a rule was inserted that any person convicted of, or charged with a crime might be photographed. We had a remand man in who wholly refused to be photographed; he was punished and the case was reported to the Secretary of State, who decided that the rule was *ultra vires* and should not have been made. This was the same Secretary of State who had previously approved of it.

If a prisoner resisted it would be possible to take a photograph by stratagem. Have you ever done this?—I have never done it. They are not very successful.

If it were known to be the rule, do you think the remand prisoner would object to be taken?—No, if they knew the rule and could be punished for disobedience. One man who was convicted of frequenting objected, but he was punished and he then consented.

(Major Griffiths.) In your experience how do men with previous convictions fare at the quarter sessions. Do the chairmen trouble about previous convictions?—Formerly if a man had two or three previous sentences he would be likely to get a long sentence, but that is not so now.

It is the custom of judges to ignore previous convictions to a very large extent?—To a very large extent.

(Chairman.) Would there be any difficulty in getting the finger-prints of prisoners by Mr. Galton's method?—Not much difficulty, I think.

That would be an advantage of his suggested system as opposed to measurement?—Measurements are very difficult to take. I have tried the employing two men to take the measurements, but they were found not to agree.

But this was on first trial?—Yes, on first trial. The men had no training or instructions.

If persons resist photography, would not they resist measurements?—Yes, they would do so.

Finger-prints would be much easier?—Yes, and measurements would be difficult.

Is the Distinctive Marks Register used in London?—I did not use it much in Wakefield, but find it now a great help in answering some of the questions that come to us. It is useful for prison purposes.

Mr. EDWIN COATHUPE, Chief Constable, Bristol City Police.

(Chairman.) You are the Chief Constable of the city of Bristol?—Yes.

For how long have you held that office?—For 18 years.

And had you any previous police experience?—I had been eight years Deputy Chief Constable at Manchester, and for three years before that I was attached to Scotland Yard.

Can you give us some general idea. (1st.) As to the proportion of local crime in Bristol; and (2nd.) Of crime by "foreign" criminals, or criminals coming from other districts?—What proportion of offenders would be local men, and what proportion foreigners?—Fully three fourths would be our own people—would be local.

Have you any difficulty in identifying them?—The difficulty is with regard to the other fourth.

What are the means you usually adopt?—The police strip the man and examine his body for marks.

And having got the marks?—They then search the register, and endeavour by this means to identify the man.

Do you identify many?—Yes; the method is extremely useful. We trace them constantly.

Can you suggest any improvements that should be made in the form of register?—I do not think so; I have not given special attention to that point.

Nothing occurs to you?—No.

Failing the Habitual Criminal Register, do you get some cases from the Police Gazette and Illustrated Circular?—Yes; from the circulars.

The police would like to have the circulars more often, or larger photographs.

Failing to get at a prisoner's identity in any other way, would you use route-forms?—Very seldom; we have no time for that. Our magistrates would not often remand for purposes of inquiry. We have no stipendiary magistrate in Bristol. It is the largest town in England which has no stipendiary, and no solicitor to prosecute on behalf of the police.

Then you have a difficulty in getting photographs for use in the routes?—Yes.

Do you photograph prisoners yourselves?—No; we want to be able to do so.

Would it not serve your purpose if you could have a photograph from the prison after the prisoner is remanded?—Yes; that would be the better plan if magistrates would remand for this purpose.

But as a matter of fact you do not photograph yourselves?—No, we have no power to do so; we cannot hold prisoners over for a number of hours for that purpose.

Do you ever send out forms without photographs?—Very seldom; that is of no use.

Have you any idea of the proportion of persons arrested who have come from other districts, and who have previous convictions?—I think there are many old travelling thieves; a good number come to Bristol.

Mr. CECIL DOUGLAS, Chief Clerk to the Lord Mayor.

(Chairman.) What office do you hold?—Chief Clerk to the Lord Mayor.

Have you held that office long? I have been there six years, and a magistrate's clerk for 18 years.

I suppose a good many of the criminals who come before your court are habitual offenders?—Certainly, a large number.

Do you consider it the duty of the police to find out previous convictions?—I do not know whether it is the duty of the police; we remand prisoners for that purpose. It is, I think, partly the duty of the police, and partly of prison warders.

Is there, in your opinion, any considerable number of the prisoners you remand for that purpose who are not identified?—I could not give an accurate percentage; a good number whom I believe to be old offenders are not reported as known.

You remand to Holloway for eight days?—Yes; for a week, sometimes for eight days.

It is a convenient place for Wales, and the West of England, and for Ireland. They can get away at short notice. It thus becomes a sort of centre for travelling thieves.

What character. Mostly pickpockets?—Mostly pickpockets and housebreakers. We are infested with pickpockets. Many come from London. The quarterly circular issued by the Metropolitan Police comes in useful, but we have the greatest trouble to get men to take an interest in the cases. They take less interest in detective work altogether than they used to do.

You do not send out many routes, but if you got photographs you would send out a large number?—Yes.

When your offenders have been convicted, do you get photographs and keep books?—Yes.

Do you have many inquiries from London and other counties and boroughs?—Yes. Our only difficulty has been with Liverpool. They would not render any assistance to enable us to prove the identity of a man charged with burglary; they refused to give the name of the officer who could identify him. The case occurred at the assizes. It was brought before the notice of the judge, and I believe it is all to be reported to the Home Secretary. We got information from the warder and it made a difference in the sentence. Some of the judges do not care about previous convictions and are extremely lenient to old offenders. We have got a good Recorder.

Have you many thieves or burglars in Bristol who carry on business in neighbouring counties?—No, very few, I think.

Do the police visit prisons in order to see if there are old offenders among the remands?—No. We would like to inspect remands. It would be a great help to go to the prison to see offenders. It would also be a good thing for county officers to inspect city prisoners. They are all in the same prison.

Do you keep any register of local criminals?—Yes. We keep a book with descriptions of all prisoners we have dealt with. It is indexed well, so that cases are easy to find.

Then do you think many previous convictions escape notice?—A good many do, I fear. Our men often know a man to be an old offender but cannot remember his name and previous history. Such cases are often dealt with summarily by magistrates as first offenders.

Do you send route-form when you issue them to the adjoining police forces first, before you send to London?—We send forms to local forces and to London in duplicate. In the case of an important prisoner we send to other places simultaneously. I do not recollect a single case of identification by route-form without photograph.

Have you any further suggestions to make?—No, all the points I had in mind have been touched on. Bristol, with a population of a quarter of a million inhabitants, has no stipendiary magistrate and no solicitor to assist in police prosecutions.

And the police, or the police and the prison warders, are supposed to make enquiries?—Yes.

And in a considerable number of cases they fail to make recognition?—Yes; I should like to enlarge that statement. I know a very large proportion of the habitually criminal class. I know some of them by face, I can tell others by the way they stand in the dock, and the part they take in the proceedings. I am surprised in a great number of instances that men whom I feel sure are old offenders are not recognised.

If they are not recognised are they usually dealt with summarily?—That depends on the nature of the case. In many cases they are dealt with summarily, where, if known to be previously convicted of felony, they must be sent for trial. For other offences we must of course commit for trial, even when there are no previous convictions.

Of those committed for trial, is any considerable number recognised after committal?—Unquestionably.

Would you hear of this officially?—Not officially, but I should see it from the prison calendar.

Does that occur in a considerable number of cases?—In about 20 per cent. I think.

And you think a good many prisoners of that class are not recognised?—Yes, I think so. I am often surprised that old offenders are not recognised.

What steps do the police take in the city besides inspection at Holloway?—I do not know exactly. An illustrated circular is issued by the Metropolitan Police, which is used.

If a prisoner is recognised in Holloway, how are you informed?—In the City if a prisoner is remanded and recognised by a warder, or by a constable, we get a form from Holloway telling us of his previous convictions, and the name of the warder who can prove them; where the magistrates will require to know of the previous conviction, we give notice to the warder to be in attendance on the day of trial. In other cases we do not require his attendance.

How do you do, at Mansion House, in the case of prisoners charged with larceny who have been previously convicted?—We are told that in some courts such cases are often dealt with summarily. In such cases we invariably send for trial. We have no option. If a prisoner has been previously convicted of felony on indictment we cannot legally deal with the case summarily under the Summary Jurisdiction Act, 1879. It is prohibited by section 14.

Have you anything to suggest in the way of improvement of system?—I believe your Committee has had a report from Mr. Williams. With regard to paragraph 4 of that letter, I would like to say this to the Committee. I have been in communication with Detective Inspector Downes, who is in charge of the arrangements for the identification of prisoners, and he states that under the old system, before the issue of the circular preventing the warders and police consulting together, they conferred together before they decided whether A or B had been previously convicted. This is now stopped, and that makes identification more difficult. Another thing, Inspector Downes tells me, and I can easily understand it, that the wearing of prison clothing by the prisoners makes the work of identification much more difficult. An experienced old thief will get into a suit much too large for him and will attempt to disguise his figure. Another reason why I think old offenders escape recognition is this: that a great number of old warders have retired.

It has been suggested to us by a good many police officers that more photography of prisoners on remand

would be a useful thing for identification purposes?—Yes, certainly.

The Secretary of State has power to make rules for this purpose?—Yes.

Supposing a rule were made in this shape—that photographs be taken by order of the magistrate who remands prisoners, would that work well?—I think my own bench would make the order in all proper cases. My bench would give all necessary facilities for identification if the Home Office asked for it.

As a matter of fact you now always remand if a man's previous character is suspected to be bad, and inquiry is desired?—Yes, I have no reason to believe that any man charged with picking pockets who has been convicted before is dealt with without the remand necessary for inquiries. In a case of false pretences we should be more likely to commit for trial at once, and let them find out his previous convictions between committal and trial. We do not make a hard-and-fast rule. The great percentage of prisoners charged with crime are remanded.

A good many you think still escape in remand cases?—Yes, I have not worked out any calculation. My impression is that under the old system before 1888 more were recognized than now.

(Major Griffiths.) Have you a large amount of local crime?—The City is a happy hunting ground for pick-pockets from all parts of London. We see a great number of old friends, but few of them are resident in the City.

Are there any "foreigners" from the country?—Yes, a fairly large number. I believe also, a good number of foreigners from abroad—German and Polish Jews, and a few Russians.

Have you anything to suggest?—I think that all prisoners on remand should be photographed. I have had in my experience many instances which shows its value. A prisoner has been remanded and no report received from the Governor of the gaol; but an officer from Scotland Yard has sent word to the police officer in charge of the case, that he had been recognised from photographs in their books. In a case where the magistrate would deal summarily with the man, I would say to the prisoner, "You have been convicted at Wolverhampton, do you admit it or will you be remanded?" Prisoner says, "I deny it." I then say, "Is that your photograph?" The man says, "It is no use denying." Further than that, I do not think I have anything to add to the report Colonel Smith has sent in on the subject.

Home Office. 18th November 1893.

Captain SHOWERS, Chief Constable of Essex.

(Chairman.) You are Chief Constable of Essex?—Yes.

How long have you been Chief Constable?—Six years.

Had you any police experience previous to your appointment as Chief Constable of Essex?—Yes, at Exeter, and Superintendent in the Devon County Constabulary.

How many years in all?—Since 1883—10 years.

The first question on which we wish information is as to the methods used by your police for the identification of old offenders?—We depend mainly on photographs. When a person brought before the magistrates is supposed to be an old offender, we apply for a remand. Then he is photographed, and route-forms with the photograph are circulated. In this way we obtain identification in most cases.

You get prisoners remanded for the purpose of being photographed?—Yes. In most cases we get photographs without difficulty, but power should be given to the police to compel suspected persons to be photographed.

Do many refuse?—A good many; particularly old offenders.

And in that case do you get them by stratagem or by force?—By stratagem usually. We do not use force.

Do you get good photographs?—Very good. They are taken by local photographers. Some are taken in gaol, but this is exceptional.

Do you use the Distinctive Marks Register and Habitual Criminals Register?—Yes, very much indeed; we find them very useful.

Do you have a good many London prisoners?—Yes. All our worst criminals come from London, the burglars and horse stealers. They go back to London to dispose of their booty. The crimes of local people are usually poaching and larceny.

Does each of your superintendents use the Habitual Criminals Register?—Yes.

Does it require a very long search to find a prisoner in the Distinctive Marks Register?—Not, I think, very long.

Something would depend on the nature of the marks?—Yes. Some are easily found. In other cases the marks are not very distinctive. I think it is a pity that old offenders are not branded. That would be the most effective way of securing recognition.

What about the Police Gazette?—It is not of much use in tracing the antecedents of prisoners. The route-form is the best when there is a photograph. Without the photograph we hardly ever obtain any result.

Do you use the Illustrated Circular issued by the Metropolitan Police?—Yes. It helps us a great deal, and is of great use in Essex. It would be more useful if issued oftener than three times a year.

Where do you send out the route-forms?—We send to the different prisons and different counties. To the

Metropolitan Police pretty early, being so close to Essex. Route-forms are not much use without photographs; with photographs they are of immense use.

You want additional means of taking photographs?—Not only power to take them, but to punish for refusing to be taken. Magistrates are quite ready to remand in all proper cases. They are always ready to help us.

You think it would be well if the Secretary of State made rules under the Penal Servitude Act, 1891, to compel remand prisoners to be photographed?—It would be better if compulsory power to take photographs were given to the police rather than prison authorities. When the photographs are taken at the police cells we have copies ready to send out the same day. If they are taken in prison we cannot have them before the third day at earliest. When the remand is only for seven days, the loss of two days in making inquiries is serious.

Do you think that many escape?—Very few escape identification in Essex.

Do many of your criminals come from other districts?—All the bad criminals come from outside Essex, burglars and horse-stealers especially. We hope soon to have telephonic communication with the Metropolitan Police,

Inspector JOHN ROBERTSON, Liverpool City Police.

(Chairman.) What position do you hold in the Liverpool Police Force?—Detective-Inspector.

Are you head of the detective branch?—No, the assistant head constable is head of the detective department. I have charge of the convict branch. In addition to other duty, I have to deal with all routes received, and routes sent out, and all correspondence relating to prisoners in custody. I have the assistance of a sergeant, and the partial services of a constable.

What is your procedure in identifying criminals?—All our prisoners are sent to the main Bridewell, and each morning, either I, or the sergeant, or constable, often all of us, visit the Bridewell, and see all the prisoners charged with felony. All prisoners arrested the previous evening are then in the Bridewell; but they are not detained there more than one day. One-day remands are kept in the Bridewell; Saturday to Monday remands, and all remands for more than one day are sent to prison. Three-day sentences are kept in the Bridewell.

In the morning, from 7 o'clock to 10, the description clerk of the main Bridewell takes the description of all prisoners before they are brought before the magistrates, and many local men are at once recognised. The father's Christian name and occupation, mother's maiden name, and (if prisoner be a married man) wife's maiden name are taken. All prisoners are indexed under their own names, their mother's maiden name, and their wife's maiden name, and these indexes are of considerable assistance, as if a man alters his name, he frequently take his wife's maiden name, or mother's maiden name, or gives one or both as before, and many are traced in this way. All this work is done between 7 o'clock and 10 in the morning. There is one description clerk for felony cases, another for "disorderly" males, and another for females. Three description clerks are employed, and they have the assistance of four or five other men. When they have done their work, I and my assistants visit the prisoners, and identify those we know. We often call in outside detectives who may be likely to know them, and the books are referred to. No prisoner runs more than three years in one ledger. The ledger is only for three years; each ledger has a separate index, so that if convictions extend over a longer period they may be traced through several books; the preceding folio is quoted in the latest ledger and *vice versa*. The felons ledgers have been preserved since 1856.

We have the advantage in Liverpool of the prison being a receiving prison for a very large area, from Birkenhead, from the adjoining districts of Lancashire and Cheshire, and from the neighbouring boroughs. I am glad to acknowledge the assistance rendered by the prison officials.

Do you visit the prison to identify prisoners from other districts?—No. No periodical visits are paid to the prison by the police.

and this will probably be of much use. Taking all kinds of crime, 75 out of 100 are Essex local men, and of the remaining 25, the greater number are identified before trial.

(Major Griffiths.) Do you find that the previous convictions make much difference in the sentences?—Yes. Most judges and chairmen of quarter sessions are very much influenced by previous convictions. Some of the judges do not pay much attention to previous convictions, but that is exceptional.

Supposing power to photograph in all cases were given to the police, what proportion would have to be photographed?—About 20 in the 100. The other 80 do not require to be photographed; they are known. The photographs are done by an outside photographer, to whom the police pay 1s. for the first photograph, and 4d. each afterwards.

Would prisoners object to being photographed if they knew that it was the law that they should be photographed?—I think not, if they knew that the police had power to compel them. If a prisoner even knew that he had to be photographed in prison, he would probably not object as he does now to being taken by the police.

Then in the case of a prisoner belonging to Liverpool being arrested at Birkenhead, the Liverpool police would not have any chance of recognising him in prison?—Not in prison, but the Birkenhead police would bring him over during the remand for the purpose of being seen. They bring prisoners to the Bridewell for this purpose from Birkenhead and other boroughs and from Lancashire.

But to return to what is done before a prisoner appears in court?—If neither the description clerk nor any of my branch nor the detectives recognise the person we apply for a remand and obtain the photograph of the prisoner at the Bridewell, before he is removed to prison. Some object to being photographed, but we have arranged a room where the objectors can be photographed without knowing it (witness here gave a description of the room). Some of the photographs taken in this way are good, others are not so satisfactory. There are some offenders who have been told of this room and they refuse to go upstairs. When this is the case we do not use force, we apply to the prison for photographs. Persons who refuse to be photographed by the police will submit in prison. The prison authorities are always ready to assist us in this matter. Probably 20 or 30 photographs are taken in the prison for the police in the course of a year.

Our albums contain photographs representing about 2,300 persons.

And when you have got the photographs do you issue the route-forms?—Yes, that is a matter requiring much discrimination. I feel it a tax upon the time of other police forces to route a man broadcast; we only route a prisoner when it is really necessary to do so, and then we exercise great care as to where we send the routes. Frequently we are able to obtain information from friends of prisoners as to who he is, or we may obtain information as to where he comes from or where he is likely to be known. Some forces seem to route everybody they get. We receive an immense number of routes issued quite indiscriminately and the labour of examining them is very great. From September 29th, 1892, to 29th September last we sent out routes for 74 persons, sending each to perhaps 20 places on the average, and we received about 1,200. Preston borough appears to route every person arrested; Salford send a great number, but they keep a good register and classify their album very well, and never fail to send a result of the case, a thing many forces neglect to do. The majority of the routes received would be from Salford, Leeds, Stafford, Nottingham, and Leicester; Belfast are now routing a good many, Glasgow and Edinburgh if they suspect the person has been our way. Newcastle-on-Tyne also sends a good many.

Do you use the Habitual Criminals Register?—We find that the register sent from the Home Office is invaluable. It is helpful to us not only for travelling

thieves but many of our local thieves. The only suggestion I would make would be its issue at an earlier date.

The Habitual Criminals Register is useful not only for identification but also for obtaining the accurate particulars of the previous conviction. The weekly list from Scotland Yard also helps us. The Illustrated Circular is a very good thing in the Metropolis but not helpful to us except for reference.

Where do you send your route-forms?—The great centres to which we send route-forms and the places from which we receive the greatest assistance are the Metropolitan Police (the Convict Supervision Office, Scotland Yard, help us very much), Glasgow, Edinburgh; and with regard to Edinburgh the police do pretty much the same as they do in the metropolis, viz., inquire at Prison and Registry, Salford, Leeds, Stafford, and both local and convict prisons.

Do you think many prisoners escape identification?—Very few. It is very seldom a prisoner gets through

the police and the prison without being recognized. After he has undergone examination by the police he has got the same to go through with the reception officer of the prison, and if not identified by either he is routed. Of 74 persons routed 64 were identified, only 10 failed.

Do you keep a record?—We have a route-book in which a man would be entered, with the date and place where his route came from.

Do you suggest any alteration in the rule as regards the photographing of prisoners?—We get very nearly all the photographs we want. We either get them ourselves or by applying to the Governor of the prison. I understand that it is the rule that remand prisoners may be photographed. I think under the Standing Order the Governor of the prison photographs prisoners without applying to the Commissioners of Prisons.

When do you get the photographs from the prison?—As a rule on the third day.

Home Office, Friday, 8th December 1893.

PRESENT:

Mr. C. E. TROUP (Chairman).

Major A. GRIFFITHS.

Mr. M. L. MACNAGHTEN.

Mr. H. B. SIMPSON (Secretary).

Sir RICHARD E. WEBSTER, Q.C., M.P.

1. (Chairman.) We have been in Paris, and seen M. Bertillon's system in operation. As we understand that you have also seen it, perhaps you will give us your opinion?—I mentioned to the Home Secretary that when I was in Paris I saw it on two or three occasions and I went into it very thoroughly, and it seemed to me, for reasons that I will state, if you wish it in that way, to be by far the best system that I had ever seen or heard of and to possess many remarkable safeguards against the possible identification of innocent people for those previously convicted. I do not care so much (although of course it is very important) that previously convicted people should be identified. Its great importance or one of its principal features, to my mind at all events, was the practical impossibility, in my opinion, if it is properly worked, of the confusion of any person charged with one previously convicted or previously charged. That was the first, perhaps the leading idea that I gathered or formed about it. And the next is the great facility for registration and classification and tracing out particular cases, assuming identity. Those are the two points which I should like to refer to subject to anything that you might wish to ask me.

2. Yes, that is what we would like from you?—I think I had better take the second first, because the reasons for the first depend on the correctness of my judgment, in regard to the second, I will tell you the practical result in regard to classification. On the first occasion when I was there, a man who had distinctly given a false name and said that he had never been charged before was measured in our presence, we asking our own questions as to the method of measurement, merely being taught as to the order of measurement, and only asking sufficient questions to understand what was being done. After five or six measurements—eight actually taken, I think—one card with the five or six measurements was given to the Attorney-General who accompanied me and myself, and without any assistance in less than five minutes we found the card, which according to the measurements, would be the man, assuming the measurements to be accurate. On that occasion the card bore a different name, the man having been identified, and we ourselves having picked out the card without the slightest assistance. There was a photograph on the first card. I should not have identified the man by the photograph; but I do not lay any stress upon that, because I do not pretend to be a judge of that class of photograph, and I am bound to say that the Attorney-General said that he should have identified the man by the photograph. However, the impression on my mind was distinct that I should not have identified him by the photograph. I may mention that in that case the previous photograph had a moustache and

beard, and the prisoner, when presented before us, had no moustache or beard. I mention that because I do not want to overstate the matter, and possibly better judges would have been able to have identified the photograph at once. I should not. Having identified the man, M. Bertillon handed to us the first card, and said, "Look at the private marks,"—you are aware, of course, that after measurement private marks are taken,—and the first mark was, that if this was the man whose name was on the previous card, there was a scar on the second or third finger of his left hand, an approximate measurement in a certain direction. Prisoner's hand was held up, and there was the scar. I then looked at the first card again. It stated that if this was the same man, he had a tattoo mark of an anchor, about an inch long, on his left arm, the posterior side of his left arm, rather faint. The prisoner had got a bandage round his arm. It was pulled off, and there was the anchor. It was not that we had got a man very like him, but it was unquestionable that we had picked out that man, and I only refer to that for the purpose of showing that, assuming it to be correctly taken, the mode of classification is singularly easy to find your way about. The whole operation would not take us more than four minutes.

3. This would be a case where the whole measurements came within one class, not a case on the margin?—Your mind is entirely following the same groove as mine. I merely mentioned that with reference to the first point of registration. I then put questions upon the very point you have referred to, viz., that the leading measurement might be a misleading one. You remember the first measurement of classification is the length of the head beginning from a point above the nose to the back. I investigated myself as to how far the leading measurements were likely to be defective or misleading. I satisfied myself, as far as my judgment was worth anything, that the probability of error of measurement is very small.

4. I think 185 to 190 millimetres is the middle class: suppose you had a case where the measurement is 184 or 185?—I satisfied myself that supposing the dividing line should indicate 185, or whatever it is, the margin would not be more than, at the outside, 183 or 187; so that anything near the line could only mean double the time for the purpose of search, and further than that, that the only result in case of failure would be non-identification, not identification of an erroneous person.

5. Supposing you missed the case altogether?—The only result would be that you would miss the case altogether, not that you would identify an erroneous

person. I was further satisfied in my own mind, and I went into it as thoroughly as I could, that the measurements which are taken as leading measurements cannot be altered at the will of the person measured. There must be possibility of mistake in the act of taking the measurement. Although I myself trying subsequently, inexperienced as I was in the taking of measurements, found that in taking this measurement from back to front of the head, that the calipers, appeared to fall into position almost automatically. I do not pretend to say whether there is a possibility of large error, but if there be the possibility of error, it would only have the effect which I have already indicated. In my opinion, with regard to all the other measurements, the leading measurements seem to me to a large extent to be measurement of bones, and they use the height only to a very limited extent, for obviously the height is one in which a man can appear shorter or longer by the movement of his knee-joints and in other ways. Therefore, from the points of view of failure of measurement, it seemed to me, from an examination of—well, perhaps, altogether some three or four cases, that I do not think it was likely that with ordinary experience a man would get into the wrong class. If he got in, assuming him to be there, it was only a question of investigating two sets according to the first leading measurements, and if he were missed it would be a case of not being found, and not the wrong person identified. Then with regard to the actual measurements taken; as to whether they are the wisest or not I am not in the least competent to express an opinion beyond this, that there seems to be such a margin of variety in the various measurements taken—for instance, this one, 185, it was not a question of everybody being close to 185, but it reached up to 200 on the one side, and the next class down to 180 or 179, or something of that kind. Therefore, the allowance for error with regard to the matter was so remarkable that I do not think there was much probability of error. I have no doubt you have been informed by M. Bertillon of what he informed me—I have no reason to doubt his statement—that his system has been in operation for ten years, and they have never known a case of an innocent person being mistaken for a guilty one. I think they do miss some cases, but they have never known a case of mistaken identity in that sense. I should like to say that, from the little experience I have had, I do not value the photograph identification very much. I have no personal experience of its working to enable me to give an opinion worth anything, from what I may call practical experience, but I looked for a very large number of cards that were admittedly identical, the same prisoners, men who had not given a false name, but men who had been in more than once; certainly the changes in the photographs were very remarkable, such as the cut of the hair, the condition of the man in health, and, of course, beard and moustache, and all those things. But the condition of the man in health appeared to make the photograph very different, although they were undoubtedly the same. I think that is all that occurs to me, unless you would like to ask me a question upon the first part of the matter.

6. I do not think we have any more questions to ask on that part. And now with regard to the second part—With regard to the second point, which is the impossibility or the improbability of a person being mistaken for the same criminal as a man supposed to have been there before, I think, having regard to the numbers of definite measurements that are taken and assuming men to be impartial and fair, that the improbability of the same combinations is so great that the system checks it. And I cannot help feeling in my own mind certain that, from that point of view, the ultimate examination made of the previous prisoner for secret marks is a great safeguard, because, although it may be an extremely useful, and in my opinion is an extremely useful method of getting at the prisoner and classifying him, so as to identify him, a man might have been imprisoned at Marseilles and then appear at Paris; a prisoner could have been imprisoned at Toulon and then appear at Havre, if there were greater identity in measurements and at the same time not absolute identity. I think the marks that were subsequently taken, assuming them to exist, would in a very large number of cases prevent an erroneous identification.

7. (*Major Griffiths.*) Have you seen Mr. Galton's finger-print system?—I have not seen the enlargement of it. What I say in regard to that, if I may express

an opinion without having seen it, is that it seems extremely difficult to classify.

8. (*Chairman.*) The classification is the difficulty; but from the point of view we are talking of now—proving identity—it seems to be absolutely safe?—I do not see any reason why it should not be supplementary, why it should not be added on. I have no practical knowledge of it, and from the point of view of classification, it struck me as extremely difficult. It would be, in fact, what I might call a supplemental test at the end of the others. I do not know whether or not it was possible to get much difference due to the degree of pressure put upon the hand.

9. The degree of pressure makes no difference—But with regard to the Bertillon system, I have talked it over with Colonel Talbot, the Military Attaché at Paris; he is a most able man. He told me that he had formed the strongest opinion; that in a few years it would be an absolute preventive of double enlistment, and it would enormously facilitate the work of the Department. I only mention that because it is an entirely different point of view, except in this respect, that there again you want only to be doubly careful that you do not charge a man with having enlisted before. It is not a matter that you fail to charge a man who has enlisted before, but you do not want to charge a man who has not enlisted at all.

10. Have you ever thought at all of the application of it to England?—I have thought a good deal about it. Do you mean from a practical point of view?

11. From a practical point of view?—I think there would be very great difficulty at present in applying it to persons who are only charged, and I do not see the necessity of it myself. I am speaking first of persons who are charged as distinguished from persons who are convicted. Practically speaking, all you want to do is to measure the convicted, not an innocent person.

12. (*Major Griffiths.*) Surely the object of the whole thing is to bring out the previous convictions?—Yes, the second time. Your first measurement need only be in the case of a convicted prisoner. The only people who could wish it to be done in the case of first charges would be innocent people, that they may not be mistaken for the person who had been originally charged; but from the point of view of public sentiment, although I personally should not have any objection, there is a reason why a man charged should not be measured. It would be in all probability wiser if you were proposing to apply it that it should be in the first instance solely applied to the case of convicted prisoners, or, if you like, prisoners charged with certain offences. With regard to the practical application of it I made some inquiries about expense, but I do not think my opinion is worth very much in regard to that.

13. But in every case the jury would not be satisfied with a few measurements for identification; they would require personal identification as well?—I do not know enough about the system to answer that question.

14. Any identification of that sort would have to be followed by a personal identification by some individual who knew the man, no jury or court would accept those measurements and finger prints or measurements alone as a proof of identification?—Of course, from the point of view of evidence, they undoubtedly would not at the present time. I do not think I should suggest any attempt to establish that such measurements should be identification at present. But I am by no means certain of what might happen 15 or 20 years hence.

15. In the first instance it really is an index to find the faces of individuals?—In the first instance it really is an index to find the individuals in order to ascertain for yourselves whether or not the person has been previously convicted.

16. Exactly?—And as I say again, to prevent a person whom a jailor thinks is very like a man whom he saw 10 years ago, being charged for the same offence.

17. That is the most important point no doubt, and must of course receive proper attention?—I do not think you can bring it out too prominently. I do not think there is anybody who takes an interest in this matter who does not believe that it is infinitely more for the protection of the innocent man who is charged than it is for the punishment of person who is charged with having been previously charged. It is, in my opinion, an absolute safeguard if properly worked—fairly, honestly worked—against an innocent person

being charged, or it even being alleged against an innocent person that he has been previously charged or previously convicted. I should think it would be a good thing if, at any rate for some years, the measurements were taken quite independently by two different people. I asked M. Bertillon about that, as to whether he found that they often made a mistake, but he told me that they really had become so experienced, that they had not found a mistake in some hundreds of times. From a public point of view—at any rate tentatively—I think it would be as well that the measurements should be taken quite independently by two different people.

18. It might be taken by the police and the warders?—I do not suggest who should do it, but there might be two independent measurements.

19. When the system is fully established, we propose that all prisoners on remand should be measured?—Well, before you can make any practical use of the system that must come. If a man is not committed for

trial, you do not care whether he has been convicted before or not.

20. (Chairman.) It is rather an important point in deciding whether he is to be committed for trial or tried summarily?—Yes. That, I thought, was a detail in the criminal law that did not affect my investigation of the system.

21. (Major Griffiths.) The curious thing with our prisoners is that the moment they know, or think we know, who they are, they give in and admit their identity?—That is what they also told me in France.

22. Is there anything else you would wish to add?—There is one other point which I think should be noted, that in three minutes we picked out that man out of 138,000 cards; it took us, certainly, not quite four minutes to get the right card out of 138,000, and that the information given by the measurements once recorded is available for and can be sent to every prison in the country.

DR. JOHN GEORGE GARSON.

23. (Chairman.) You are one of the vice-presidents of the Anthropological Institute, are you not?—I am one of the vice-presidents.

24. And you have done special work for the Anthropological Institute?—I have been working not for the Anthropological Institute alone, but I was for 10 years assistant in the Anthropological Department of the Royal College of Surgeons Museum, and I have also done a very considerable number of examinations of the living subject.

25. By measurements?—Measurements of the living.

26. Then you have a good deal of experience yourself in taking anthropometric measurements?—Very great I should say.

27. And also in training other people in it?—Yes, I have had considerable experience in training other people also.

28. Have you gone into M. Bertillon's system of measurements?—Yes, I am thoroughly acquainted with the system.

29. The first point on which I think we should like to examine you is the question of what measurements, if we were to take some part of M. Bertillon's measurements, what measurements are best to take for the classification of criminals?—Bertillon's measurements include the height, the span of the arms, length, and breadth of the head, length and breadth of the ear, the foot, the middle and little fingers, the fore arm, the cubit; these are all his measurements, I think. There is the colour of the eye, the hair, and beard, and also any marks on the body.

30. Yes, but then the point is this, I think. For the purposes of classification we want, do we not, to have the measurements which are most permanent in the individual, have the widest range of variations in different persons, are most convenient to take, and also have the least correlation to one another?—These are the different points for which one has to look. The most important measurements are those that can be taken between absolutely fixed points of bone. Of those of M. Bertillon, which I have just mentioned, I consider the length and breadth of the head, the cubit and the middle finger, the best and most important.

31. Those four?—Those four. The length of the foot is a very good measurement too, but care has to be taken in making it. The criminal, or whoever is being examined, has to stand on one foot in rather an awkward position. Of M. Bertillon's measurements, these five are the best, I think.

32. Then you think the fifth one, the foot, is not so good as the others?—Not quite so good.

33. On the ground of the awkwardness of taking it?—Yes, and also there is an arch in the foot—in the central part of the foot—which is liable to vary somewhat.

34. (Major Griffiths.) Unless the foot is absolutely flat?—Yes.

35. The toe-nail causes some difficulty too—the length of toe-nail?—Yes, and another thing is in wearing boots, the large toe gets twisted round, very often a bunion forms on the great toe joint, consequently you have a reduction in the length of the foot produced as age advances.

36. (Chairman.) What do you think would be the danger of error in the foot; how much variation might there be?—From half to nearly a centimetre.

37. Nearly a centimetre?—That would be an extreme variation, certainly. I would consider about half a centimetre—five millimetres—would not be a very great difference in the measurement of the foot of a young man and when he is old. But for its liability to vary during life I think the length of the foot a better measurement for purposes of classification than the finger, because it is longer and has a greater range of variation in different persons.

38. (Major Griffiths.) I was going to ask what do you think the next best measurement after the foot or equal with the foot? (Chairman.) Or instead of the foot?—Instead of the foot I strongly recommend the breadth of the face, across here (showing), the bizygomatic breadth; I have got some statistics of it. Every year for the last seven or eight years I have superintended an anthropometrical laboratory at the British Association meetings; during that time I have measured something like 1,000 people, and I have got out the statistics of the breadth of the face, which perhaps would give you some idea of its merits. The table shows you that though there is correlation between the breadth of head and breadth of face, yet that correlation is not very close. You see that there is a certain correlation, because the figures run somewhat obliquely; but take any breadth of head that you like—this is the breadth of head down this column, the horizontal row of figures is the breadth of face—you see there is a very great range in the breadth of face correlated with it. That is to say, that a man with a head of, say, 154 millimetres in breadth may have a face breadth of from 112 to 144 millimetres.

39. There is certainly a great variation?—There is a great variation.

40. (Major Griffiths.) Would you hand this in?—I shall be very pleased, or I will make you a copy more suitable for printing.

41. (Chairman.) Perhaps you can make some summary of it?—I can make a table of it by putting in the numbers in the little squares. (See Table, printed p. 55.)

42. (Major Griffiths.) So that you would really recommend the breadth of the face, or substitute it for the foot?—Well, I think it fulfils the conditions I have indicated as being essential for a good measurement. It is easily and accurately measured, not liable to vary during life, and not closely correlated, as we have seen, to the head breadth.

43. (Chairman.) How is it taken, and how far would it be affected by emaciation or stoutness?—It is best taken with sliding callipers such as are used for measuring the head. Being measured between two subcutaneous surfaces of bone, it is little affected by emaciation or stoutness, certainly not more than the breadth of the head is affected.

44. Of course you would allow there was some advantage in measuring the foot simply on the ground, that to have the same thing that they have in France counts for something?—Oh, of course, that is so decidedly, and probably when you come to speak about the method of making measurements I would have something to say in regard to that also.

45. (*Major Griffiths.*) I think it was Mr. Galton yesterday or Sir William Flower who said something about the hip bones?—There was another measurement I was going to suggest, which would be a very good one, that is the breadth of the pelvis or haunch bones, not the hip bones. The only difficulty I have regarding the pelvis is this, that you require to strip a person; at least the trousers must be down.

46. That is not a difficulty with us, because our prisoners are always stripped?—Very well, then that would be a most excellent measurement. I had in a table of pelvic measurements of skeletons, which shows considerable range of variation.

TABLE OF MAXIMUM BREADTH OF PELVIS (Skeleton).

Measurement of Pelvic Breadth.	Number of Cases.	Total.
315-319	1	65
310-314	2	64
305-309	1	62
300-304	1	61
295-299	2	60
290-294	4	58
285-289	9	54
280-284	6	45
275-279	7	39
270-274	8	32
265-269	9	24
260-264	7	15
255-259	5	8
250-254	2	3
245-249	1	1

47. And the measurement itself is very unvarying in each person, is it not?—Yes, very invariable; you can feel it, how very firm it is; at this point there is hard bone on each haunch which is just below the skin, so that you can get an exact measurement from point to point with a sliding rule.

48. (*Chairman.*) If a man got very stout, would that affect the measurement?—No, not particularly; the stoutness would be above or below. Another very good measurement is the height of the knee, but it requires to be done very carefully. I am not quite so certain about recommending that, considering that you would not have highly educated men to make the measurements probably. Mr. Galton did take the height of the knee at one time, but what would require to be done if it were taken would be to seat the person on a stool of perhaps not more than 12 inches high, and have some arrangement against which the leg would rest, so as to insure it being in a vertical position when measured. If you feel on the top and outside of your knee at this point, when you hold your knee in a flexed position, you will feel that there is hard bone, showing that you have got the end of the bone there perfectly subcutaneous.

49. (*Major Griffiths.*) Then as to the breadth of span of arms that M. Bertillon takes?—The span if taken as he does it, against a wall, is a very fairly good measurement; if taken in any other way, I do not give much for it, because so much depends upon the will of the person, exactly in the same way as the height.

50. (*Mr. Macnaghten.*) But I should have thought as to the height of the leg up to the knee, that a man could contract it a little?—Not if he is put into the particular position I have indicated.

51. We should have some rather dubious kind of gentlemen to measure?—Yes.

52. I thought you could contract the calf of your leg?—That would not affect the length of the leg if the foot is flat on the ground.

53. (*Chairman.*) Would not these knee measurements be more or less correlated with the cubit?—To a certain extent, but I do not know that they would be very closely correlated, but I have no statistics showing whether it is so or not.

54. (*Major Griffiths.*) What do you think of the ear measurement, which is one of M. Bertillon's measurements?—The ear may be taken, though it is somewhat delicate to measure properly, and its lower end varies in form. The *Saxon* ear is said always to have a distinct lobe, but in other races the lobe is wanting, so that you get a considerable amount of variation, and I think it would be rather difficult perhaps for an uneducated

person—when I say that I mean persons of such education and training as you are likely to have as measurers—to take its dimensions with sufficient accuracy to use it as a measurement for classifying; besides its length is so short that an error of even one millimetre would be considerable per cent. of its length.

56. The shape of the ear comes under “distinctive marks”?—That is so.

57. You were going to tell us something about the method of taking the measurements, were you not?—With regard to the length of the head, M. Bertillon takes it from the root of the nose, but it is somewhat troublesome to get an instrument to lie upon that point.

58. In India, Mr. Gayer has invented a modification, or rather an addition to M. Bertillon's instrument, in the form of a split tube which slips on to one arm of the callipers with a transverse rest for the nose.

59. Which fastens over the bridge of the nose?—So that the point rests upon it.

60. (*Chairman.*) You have got a specimen?—I have tried to get a copy of the illustration, but have not succeeded. I can give you the reference however; it is described and figured in a report to the Government of Bengal in 1892, last year.

61. (*Major Griffiths.*) They have introduced measurements then in Bengal?—Yes, I believe so.

62. (*Chairman.*) What was the subject of the report?—It was on this subject, the Anthropometric Identification of Criminals. Then, perhaps I may say, treating of that paper also, he has also introduced a rest—a handle—by which you can hold the callipers more steadily while using them, and has attached a small spring to the limbs so that they are drawn together with a regular pressure. And then in regard to that heavy instrument by which the cubit is taken, he found it was rather difficult to get the people who make the measurements to take them accurately, he introduced a coiled spring by which the sliding arm is drawn home with more or less constant pressure. He found it most important, for the foot especially.

63. To have a constant pressure?—To have the arms of the instrument pressed against the part of the body measured with a constant pressure. That is an instrument which I have used for measuring the head. (*Instrument produced.*)

64. That is almost the same as M. Bertillon's?—Very nearly.

65. It is rather lighter?—This is Broca's; M. Bertillon's is almost the same as Broca's, only much heavier. This is the original instrument which was invented by Broca for making measurements on the living.

66. (*Major Griffiths.*) I suppose, as a matter of material, it would be better to have them in metal than in wood?—Oh, they would need to be in metal.

67. (*Chairman.*) In India do they measure the head length from the same point on the nose as M. Bertillon does?—I think they have followed M. Bertillon entirely. In all our measurements for race characters, we take the glabella, as it is called; that is to say the most prominent point of the forehead. There is less danger decidedly of putting the point into the eye in that way, and it gives you a maximum length of head.

69. A little longer than the other?—A little longer than the other; all our statistics are made by this means.

70. Do you find it as easy to fix the exact point to take it from?—Quite as easy; the only difficulty that I could imagine regarding this point is that there is an air-space underneath the glabella which increases in size as you develop towards adult age; in a child it is much less than it is afterwards. That can be the only objection that I can see that could be advanced against taking the measurement from this point.

71. (*Major Griffiths.*) And the same variation would not occur if it were taken from the root of the nose?—No, not from the lowest part of the bridge of the nose; still the glabella is a much better point generally.

72. Easier to get at?—Yes, I think so, especially if it is taken with sliding callipers like those of Sir William Flower. We consider it is far the best point to take. The root of the nose used to be taken by Professor Virchow in taking the length of the head,

but I think he has now abandoned it and follows every other person in taking the glabella.

73. Why did M. Bertillon take the root of the nose?—Why he took it I cannot understand, unless for that reason I have just mentioned, which would only apply to young criminals of less than 25 years of age at the very outside.

74. (*Chairman.*) What age do you think we can take as the age after which the size of the skull would practically not vary?—The skull, as a rule, has attained its full size from about 22 to 25; it certainly may increase after 20, but to a very small extent. I have put in my bag here an important paper by Mr. Venn, of Cambridge—The results of measurements made in the anthropometrical laboratory of Cambridge University on 1,095 students. These tables will show you the results.

75. Are those individual cases or average?—These are average cases, as far as I know there are no statistics on the same individual, showing the variations, or whether there are variations with the regular sequence of years after the age of 23.

76. There are very slight variations after 21?—Yes.

77. (*Mr. Macnaghten.*) I can understand the breadth and length increasing, but how does it happen that at 24 it goes back?—That must be the accident of chance.

78. (*Major Griffiths.*) Of the measurements?—Yes, in the series of men measured at 24 years, the number of students with small heads happened to be greater than in the preceding series.

79. (*Chairman.*) It is an average?—Yes. These anomalies are corrected in the plate which accompanies the paper, showing the curve of the increase in size of the head, of different grades of students.

80. Poll men increase most rapidly?—Yes, they do.

81. What do you think as to the adoption of the metric system of measurements?—I cannot too strongly recommend its adoption for all measurements, even for stature and span, but I consider it is absolutely necessary, if we desire accuracy, that the smaller measurements, such as those of the head, arm, leg, or other parts of the body, be made by the metric system.

82. It does not really involve any training in the metric system on the part of a man?—No, it does not.

83. They simply would tell off the instruments?—They simply would tell off the instruments.

84. They need not even know there are such things as millimetres?—Well, I strongly advocate training the men in everything, and showing them the reason why a thing is done in a certain way, as I like to get them to bring intelligence to bear upon the subject that they are doing. You get much more reliable results than if they are simply mere mechanics working by "rule of thumb."

85. But still, as a matter of fact, it is not absolutely necessary for them to understand the metric system?—Oh, no, it is not necessary; they simply know that the breadth of the head is 140 or 150, or whatever else it is.

86. What sort of men do you employ in making these measurements?—The most that I come across are all educated gentlemen, very often travellers.

87. Then what do you think about the possibility of getting prison warders to do it?—I think that anyone who is a good writer, or dexterous generally, will very probably turn out after some training a fairly good measurer.

88. You have had some experience, have you not, training police in ambulance work?—Yes. I have had very considerable experience in training and in examining police in ambulance work.

89. So that you know pretty well what the capacity of that class of men is?—Yes, I know very well what the capacity of those men is, and I have found that the older men who have got as it were into routine habits, mechanical sort of habits, are usually the worst to train; if you get an older man—

90. (*Major Griffiths.*) That is a question we have already arrived at, that those that we taught should be young men principally?—Yes, that is very essential.

91. (*Chairman.*) You do not think there would be any difficulty in getting young men taught sufficiently

to be able to do it?—None; there need be no difficulty whatever.

92. Have you made any table of the margins of error which occur in these head measurements?—No, I have not.

93. You do not want it for your purpose?—In general anthropometry on the living one gets few opportunities of obtaining such statistics, but I have had considerable experience of repeated measurements of skulls and limb bones on the skeleton. In the case of head and other measurements which are well defined, the margin of error is not great. Skulls measured independently by Sir William Flower and myself in the College of Surgeons Museum, or which I have repeatedly measured, would sometimes show a difference of 1 or rarely 2 millimetres, but in most cases the results would be the same, the skulls being under similar conditions when measured and re-measured. There are certain errors liable to occur in making each measurement, and it is necessary for the measurer ever to be on the watch to guard against making them. For example, the breadth of the head, which should be measured exactly transversely to the head length, while the ends of the callipers are held exactly level, is liable to error through the callipers being held more or less obliquely in one direction or the other.

94. But do you think, in practice, the error would be more than 1 millimetre or 2 millimetres?—I do not think it should be with fairly well trained men.

95. (*Major Griffiths.*) Could not that be counteracted mechanically in some way by having a third leg to the calliper to fix it to the upper part?—I am afraid not. I prefer the sliding callipers to those of Bertillon, because you have got the bar across, which enables you to see pretty well whether you are holding it horizontal or not.

96. (*Chairman.*) You prefer the sliding callipers?—Yes.

97. Professor Flower's?—Yes, callipers of that kind.

98. How long a training do you think it would require to teach a man?—I should think about three weeks or a month would be sufficient.

99. Giving an hour or two of measuring a day, I suppose?—Yes. I would recommend that first of all the measurements be explained systematically on the skeleton in the first instance, and the men shown exactly why everything is done; then proceed to exercise them for the practical work of measuring the living.

100. Do you think the best plan is to send one or two warders to Paris to learn it from M. Bertillon, or do you think they would learn it here?—I should think they could be taught it very well here.

101. (*Major Griffiths.*) And we might teach them our own way?—Yes, quite so. I think it would be much better to train them at home.

102. I suppose you have no doubt that there is no variation in these various measurements after 25?—Not appreciable.

103. Not appreciable?—The head measurements I consider are really stationary in the adult, although variations take place in the structure of bone in old age, but that is more particularly in regard to the proportions of the various constituents of the bone—the organic become less in proportion to the inorganic.

104. (*Chairman.*) Would you undertake to teach warders these measurements?—Yes, I should be very pleased to do so, very pleased indeed.

105. (*Major Griffiths.*) To teach a few to start, at any rate?—Yes, I should be very pleased to do so.

106. And then, if you had six or seven men well taught, they could teach other men?—I do not think that would be an advisable arrangement, but would strongly recommend that all the men needed for this work should be taught by an experienced teacher who has had a scientific training, otherwise errors in method and results will be increased at an inverse ratio.

107. (*Mr. Macnaghten.*) They would form a nucleus?—They would certainly form a nucleus. I think it would be a good plan in starting anything of this sort to make it a reward to be a measurer, and so to give some stimulus to a man to do the work well. In fact you might train a greater number than you actually

want and make a selection—make competition for the posts.

108. (*Major Griffiths.*) Make it promotion to become what we call a reception warder for the purpose of measurement?—Yes, and he should have passed competent examination before you allow a warder to take the measurements.

109. You see we should want about 60 warders?—Yes. There would be no difficulty in teaching that number.

110. We should probably have to take the material we could get; we should not be able to compete very much.

111. (*Mr. Macnaghten.*) Well, but 60 would only be one man for each prison; you ought to have a kind of understudy, I suppose?

112. (*Major Griffiths.*) And in the big prisons you would want two or three in the reception office; in the smaller prisons you would only want one; that is where the difficulty comes in.

113. (*Chairman.*) Yes, there would be a difficulty; the medical officer might sometimes superintend.

114. (*Major Griffiths.*) In a small prison he is an outsider, he merely comes in for his work?—But the medical officers would have to be instructed in it also; they are not by any means up in this work.

115. It is purely mechanical?—Yes, but the measurer requires to think what he is about.

116. (*Major Griffiths.*) Perhaps you can suggest improvements upon the French instruments, or do you consider them the best possible?—No, I do not think so; I think we should get equally good instruments made in this country.

117. (*Chairman.*) Should we have to start making new instruments, or are there instruments to be got?

118. (*Major Griffiths.*) We could make all the instruments; once get your plan, there is no difficulty in producing the thing by contract in any quantity?—Yes, it would depend on the measurements that were finally settled to be made.

119. (*Chairman.*) Do you know Mr. Galton's Finger Print System?—Yes, I have worked with him for over a year on these finger prints.

120. Our idea is to classify first by four or five measurements and then by the finger prints?—Oh! You mean to classify by finger prints also?

121. Classify by measurement and supplement by finger prints?—That is distinctly the value of them; they are quite as good as photographs.

122. (*Major Griffiths.*) We shall have the photographs too as a third means of identification?—Yes, that would be very good; in fact one could almost do without the photographs if we have the finger prints, I think.

123. You like the finger prints?—I like the finger prints very much indeed; I think they are very important.

124. (*Mr. Macnaghten.*) What we thought the weak point was the means of classification there; there is not really a mode of classification?—I do not think it is possible to classify, except very roughly, by finger prints.

125. You see, you have only the arches and the loops and the whorls?—These are the only three forms you have; if you want a case identified, the imprint would require to be sent up to some central office, where some expert would go into the question and examine all the different minutiae.

126. Of course, as a matter of classification, M. Bertillon's system is perfect?—I think it is as perfect as any system can be for purposes of classification.

127. It is an admirable system?—But the limits of the divisions or groups that are used in Paris would very probably not apply to this country.

128. (*Major Griffiths.*) No, the race characters would be different?—The race elements, of which the population of this country are composed, are blended in different proportions from those of France, indeed there are some race elements in this country which do not exist in France and *vice versa*; the measurements also of English people are different from those of French, consequently the limits which have been fixed for the middle groups of each measurement to give an equal division of cards in the different departments of

the cabinet at the central office in Paris, if adopted in this country, would produce a very unequal division of cards. For example, the limit fixed for medium heads, as regards breadth, is 154–158 millimetres inclusive. This it is calculated will divide, say, 90,000 cards into 30,000 narrow, 30,000 medium, and 30,000 broad heads. If the same limits of medium breadth were adopted in England, I calculate, from the table of measurements I have handed in, that instead of there being an equal number of cards in each group, there would be 32,368 narrow, 35,211 medium, and 22,421 broad heads. It is therefore evident that lower limits than those adopted by M. Bertillon for the medium group, as regards head breadth, will require to be taken in this country. Other measurements would vary in the same way, so that we will require to have our own divisions of the groups.

129. That is only a matter of cataloguing after all for the expert who has got his central office?—Yes.

130. You cannot settle that until you have got the measurements?—Yes, we could, as there exists sufficient materials for determining what should be the limits of the groups. We have several thousand measurements from all parts of the country now, and there should be no difficulty whatever in working out the limits.

131. So that you could give us the proportionate limits of each class, the long, medium, and short?—Yes, for almost all the measurements. The only one that there are no statistics of is the foot measurement.

132. (*Chairman.*) Suppose you had a collection (say) of 500 cards, and classified them roughly by the finger prints, could you find your cards out of that number?—Finger points alone?

133. Yes, after you had got the total number of cards reduced to classes of about 500 each?—That is rather a large number, I think, to classify by finger prints.

134. You think that is rather a large number?—Yes.

135. You think it would be better to have only about 100?—Very much better; 50 I would say.

136. Mr. Galton, you know, picks them out very quickly out of a very much larger number than that?—I know he does; but unless you are going to have experts to do it you will find difficulty.

137. It would only be done at the central office, of course, and by an expert. At the prisons, all that would be wanted is a merely mechanical process, and all the cards would be at one central office where they would be classified by an expert. Do you see any difficulty about that?—No, but I do not think it is desirable that at the central office such a system of classification should be adopted as requires minute examination of the finger prints, as with a lens, or counting ridges, before the cards could be marked and put into their proper pigeon-holes. The impressions are often not very distinct.

138. (*Major Griffiths.*) We went to Pentonville last week and we took 100 prisoners whose hands were in all conditions from picking oakum and so on, and we picked out the others?—Yes.

139. (*Chairman.*) There was not a single one of the 100 prints taken that was not easily decipherable?—Yes, but I think it would be very much better to trust in the main to measurements for classification, using the finger prints chiefly for identification.

140. Is there anything else you have got to say?—There is the subject of peculiar forms of any part of the face, like the ear.

141. Which ought to be used as a distinctive mark?—Well, of course, if you have a profile photograph, that takes in the ear, which is important. Then I was going to suggest that there might be some advantage in noting the outline of the nose. In the ethnographical survey that we have going on just now in this country we have the outlines of noses recorded. These are the various types of noses. (*A copy of "Notes and Queries on Anthropology" was here produced.*) The first five are well-known forms, and they are very easily distinguished. The measurer standing at the side simply notes, by a single numeral, which form of nose the man has, unknown to the criminal who is being measured. It might be useful.

142. (*Major Griffiths.*) I doubt if there is sufficient difference; you know we have to do with warders?—

Yes; if you have got a profile photograph it is not necessary.

143. The colour of the eyes?—The colour of the eyes is a very difficult question.

143. (*Major Griffiths.*) M. Bertillon has seven colours, has he not?—Yes.

145. (*Mr. Macnaghten.*) Do you think there cannot be more than three?—Well, the arrangement I came to in regard to this subject in "Notes and Queries for Anthropology," compiled for the use of travellers, who are usually pretty fairly educated people, was to divide the eyes into three primary groups—dark, medium, and light; we have figured four eyes to show the variations of the medium group. All these forms are included in the medium group, eyes at all darker would be called dark, and anything lighter would be called light.

146. (*Chairman.*) What is this?—That is hair colour, and the other is skin colour.

147. (*Major Griffiths.*) Skin colour is not much used, is it?—Not in this country.

148. And hair colour?—That we class in the same way as the eyes—the dark, the medium, and the light.

149. For the purposes of identification the hair colour would be useless, of course, as it changes?—After a time it changes colour.

150. (*Chairman.*) Have you anything else noted?—I think that is all that I have to say. I may add that I consider the adoption of the anthropometric method of identification in England is very desirable, and would mutually be of advantage both to ethnological science and to criminal anthropology.

LETTER to the SECRETARY from SIR WILLIAM FLOWER, K.C.B., with regard to Dr. Garson's Evidence.

British Museum (Natural History),
Cromwell Road, London, S.W.

DEAR SIMPSON, January 11, 1894.

I have now carefully read Dr. Garson's evidence given to your Committee, and it seems to me to be all quite satisfactory.

As I told you, I have not had the experience that he has in measuring the living, all my anthropometrical work having been confined to osteological specimens, and I have had no means of testing some of the points upon which he speaks with authority. I see, however, no reason to question any of his statements or opinions. We shall be in a better position to speak positively on the value of some of these measurements when fuller data have been collected relating to the same individual

at different periods of life and at various intervals of time. Changes in the length and breadth of the head, after the age of 25, must be very slight indeed, and if they occur would be all in the direction of increase. The same would be the case with the breadth of the face, as the zygomatic arches might possibly develop with great exercise of the masseter muscles. The measurements made at Mr. Galton's laboratory will I hope be the means of giving this, and still more, the greater number that will be obtained when what I trust will be the recommendations of your Committee are carried into effect.

Believe me,

Yours very sincerely.

W. H. FLOWER.

Home Office, Monday, 18th December 1893.

PRESENT :

Mr. C. E. TROUP.
Major A. GRIFFITHS.

Mr. M. L. MACNAGHTEN.
Mr. H. B. SIMPSON (Secretary).

Mr. FRANCIS GALTON, F.R.S.

151. (*Chairman.*) You have studied the subject of finger-prints for a good many years, have you not?—I have; I took up the subject in 1888.

152. You took it up originally chiefly from the point of view of heredity and racial distinctions?—Yes, subsequently I became interested in the matter of personal identity. I gave a lecture on personal identity before the Royal Institution in 1888, in which I described M. Bertillon's plan and added some views of my own.

153. The questions we are going to ask you now will be chiefly on one or two points upon which we want to have your evidence formally on the notes. They will be merely supplementary to the explanations you have given us already, when we visited your laboratory. The first thing we should like to hear you about is this—there are two qualities in the finger-marks which you think specially suit them for the purposes of establishing identity; the one is the persistence of the marks, and the other is the enormous variety in different individuals?—Quite so.

154. First, we should like you just to tell us in a word or two the evidence you have of the practically absolute persistence of the marks?—I hand you an album which contains all the evidence I possess, or nearly all, upon which those conclusions are based that are given in my book entitled "Finger Prints"; they are the prints of the fingers taken of the same persons at the beginning and end of different intervals of time. They refer to 10 different persons, the interval between the first and the second impressions varying in the different cases from 9 to 31 years. I have also this other packet of prints from eight different natives of India, which were taken at Hooghli in Bengal in 1878, and again in 1892.

155. That is an interval of 14 years?—Of 14 years—these are the originals—they have been photographically enlarged, and the enlargements are published in my book on "Decipherment of Blurred Finger Prints." Extracts from those in the album were published in a memoir read before the Royal Society in 1891, and part of them were reproduced on a still more enlarged scale in my book "Finger Prints."

156. And these examples go over the whole of life, do they not—I mean in periods?—They do, from childhood to past 80. Here is a case of a gentleman in advanced life who took his impression in sealing-wax in 1873, and again in 1890, he being then past 80. I show some of my earlier attempts, in proof of the carefulness of the way in which the prints have been worked out. These were enlarged, some by a camera lucida and the others by a pantagraph, from already enlarged photographs, and I have in each case marked the points of resemblance; the results have been published in my book on finger-prints. I especially draw attention to part of the palm of a hand of a child

in 1877 and afterwards as a youth in 1890. I have divided the numerous points of comparison into groups bounded by coloured outlines in order to distinguish them and placed numbers corresponding to each. There are no less than 111 coincidences in these two prints.

157. In every case there is a coincidence?—Not a single exception.

158. You have never found a single discrepancy?—But one; to which I have given much prominence in my book on "Finger Prints."

159. That was the case of a child 2½ years old?—Yes, two ridges had merged into one by the time he had reached the age of 15.

160. But with that exception you never found any single discrepancy?—No.

161. And there has been no discrepancy in adults?—Not the slightest.

162. It has only been in that case of a child?—That is the only case I have met with.

163. (*Mr. Macnaghten.*) And this was after an interval of 13 years; 1877 to 1890?—Yes.

164. (*Chairman.*) Then you think the evidence of persistence throughout life is practically complete?—I think so; indeed I am sure of it.

165. Then have you gone into the question of how far they are affected by accidental injuries?—Yes, by accident and by age. I have a great many cases here in which the deterioration by age alone are shown, and others by age and hard work combined, but you will see on looking them through—these are south-country labourers—that in every case the pattern can be made out though there has been much deterioration in the clearness of the ridges. Now I show a case of a burn, it occurred to my assistant Sergeant Randall; he burnt his finger badly and took impressions subsequently, first when the burn was recent, then when it was healing, and again when it was almost healed; the finger is perfectly healed now.

166. Do the original marks re-appear exactly as before?—Just as before; there is not the slightest alteration.

167. After being obscured for some time by the burn all the ridges re-appear exactly, with no variation whatever?—Exactly, not the slightest.

168. When there is an injury leaving a permanent mark, if it is a very bad one, it may possibly obscure the pattern altogether?—One kind of injury obscures, but others only distort. Of the kind that obscures I show you some instances here (*showing*).

169. (*Mr. Macnaghten.*) Is that one obscured?—Well, this barely obscures the pattern; I could make out the pattern.

170. You have marked that with a Z, with a whorl underneath it?—Yes.

171. You can see there is a whorl?—You can clearly see there is a whorl here, but I can show you more difficult cases to deal with than this. In my book on finger-prints I have given a case in which a tailor—

172. (*Chairman.*) But the point that we want to get at is this,—the injury may obscure the pattern or distort the pattern, but does it ever produce alterations in the ridges such as to cause any confusion?—Rarely so as to cause any confusion. A cut must be deep in order to leave a permanent mark; an injury, whether it is an ulcer or a burn, must go deep, because the glands, whose ducts are included in the ridges and which appear to be the cause of the ridges, lie deep. When a deep cut is healed the ridges are distorted, much as the strata of a geological section are distorted by a subsidence or by a fault, but they are quite easy to trace.

173. It is always perfectly easy to tell that that is the result of an injury?—Oh, quite so.

174. You can never mistake it for an alteration of the pattern?—Never, not only is it easy to tell that it is the result of an injury, but the very sign-manual of the injury is remarkably definite.

175. In fact, it becomes an additional mark; it even assists the classification, does it not?—Quite so.

176. Then supposing that it were applied to prisoners, would it be possible for a person to obliterate the marks altogether?—It would be possible for a person to obliterate the marks altogether; in that way declaring that his antecedents were more or less suspicious or dangerous. If they were obliterated only to the extent to which Randall's burn has obliterated them, I presume a week in the hospital would entirely restore them, proper precaution being taken.

177. In fact he could hardly destroy them altogether except by cutting off his finger tips?—Except by serious injury; an injury that would take away the sensitiveness of the finger.

178. Then practically there would be no probability of any considerable number of people doing this?—I cannot think so; it is a matter of judgment, but I do not think so.

179. (*Mr. Maenaghten.*) No, no, I quite agree with you?—Let me say that the indications on the inner surface of the hand are so numerous, that if out of the whole hand half an inch square were left intact, there would be enough in that to prove identity by comparison, but it would not do for indexing purposes.

180. (*Chairman.*) That brings us to the second question we wished to go into, the amount of variety in the finger-prints. I think you might tell us the results of your calculations on that point, we need not go into the details?—It is extremely difficult to answer the question in a few words, because some patterns are very common and others are very rare. I am now speaking of the patterns as distinguished only by the letters A, L, W, of which I submit various specimens.

181. Well, I rather wanted to go into the questions of how far the identity of two finger-prints established the identity of the person?—The probability of identity or the reverse that is given by comparing the details of finger-prints is enormous; I made a mistake in one paragraph (p. 110) in my book on finger-prints where by accident it was understated tenfold. It may be of interest to show the original experiments I made to determine the degree of trustworthiness of the evidence afforded by the details in finger-prints; their principle is described in that book.

182. The net result of your experiments was to show that the chances of two finger-prints being the same, within a limited area, was one in sixty-four thousand millions, is not that so?—Yes; that was the result of the calculation that I made upon a trustworthy basis. Still, I always fear these large numbers; I merely gave those figures as a perfectly reasonable result after very careful experiments; but I do not cling to them at all.

183. At any rate the probability is absolutely enormous?—Yes; it is enormously greater than what in popular language begins to rank as certainty.

184. And if one takes two or three fingers into account, it is so enormous that it can hardly be put down in figures?—It is like comparing the ground plans of towns, each of which consists of very many

streets, many bifurcations, and of totally independent architecture; it is impossible to mistake the plan of even one town for that of another; much less to do so in two or three consecutive cases.

185. It is something like the chance of two cities being constructed by accident on exactly the same plan; that is what it comes to?—Exactly.

186. But to make out evidence of identity from these minutiae it must be done by an expert; is not that so?—It must be done by an expert if it is to be done exhaustively. If it is to be done sufficiently to give a strong moral probability, a man with very little training could, without photographic enlargements, do it well enough to make it worth while to send it to an expert or otherwise to incur some expense to obtain fuller evidence.

187. Of course if it were to be actually used in a court of law as evidence, you would have to have it enlarged by photography and fully explained to the jury?—A finger-print should be very much enlarged by photography for easy explanation to a jury.

188. For ordinary purposes—supposing a warder states he can identify a particular man—in order to make sure that he is not making a mistake, it would be quite enough for any ordinary person to compare the two sets of finger-prints?—Quite so; supposing he had had some little experience in making these comparisons. A person who is quite raw does not know where to fix his attention; pointers of this kind (*showing*) greatly facilitate. Any person who examines minutiae, and on whom some responsibility is thrown to do it well, ought to possess himself of a watchmaker's lens, or its equivalent, and a few of these rude tripod pointers, one of whose feet is a pin to place on the particular point to which he wants to attend.

189. Well, coming to the question of cataloguing, that involves the settling of patterns, does it not?—If this simple A, L, and W principle is adopted, a set of patterns is wanted for reference such as those on the table. There should also be typical specimens of those patterns about which doubt may reasonably arise. Then, by putting below each specimen the letter that is intended to represent it, uniformity in treatment can be ensured.

190. What is the proportion of patterns in which doubt has actually occurred? In what number of finger-prints would you find an ambiguous case, would it be one case in 20?—Ambiguity has many grades. When my superintendent marks the prints and hands them over to me, I have to make a correction—but seldom a serious one—in about one in 15 sets of finger-prints.

191. That would be one in 150 finger-prints?—Yes.

192. How often would you have to refer to these specimens to settle a pattern; should you say once in a hundred sets?—Though I have prepared these specimens only lately, I do not think I should have to refer to them often now.

193. You know the work so well now?—I am very familiar with it, and find certain ambiguous cases to recur so frequently, that when you have determined how to name them, they cease to be ambiguous.

194. It is only a question of learning which of the classes these ambiguous patterns belong to?—Quite so. May I take this opportunity of making an explanation? I was at a little disadvantage when the Committee was appointed, as I had not then determined how to class many of these ambiguous cases. My plan had been to leave it to Randall to write the title to each card and for me afterwards to revise them. Then I noted the more or less ambiguous cases; where there was decidedly room for doubt we conferred together sometimes. Then the cases of doubt became fewer and fewer, and I had intended at the end to have leisurely accumulated and photographed a good set of the doubtful cases, and finally to fix how they should be classed. But when the Committee was appointed it was necessary for me to catalogue with haste my collection, although these ambiguous cases had not been so thoroughly worked out as I should have liked.

195. Then do you think there would be any difficulty, supposing these were used for identifying prisoners, in getting one or two persons who in a reasonably short time might learn to work at deciphering patterns?—My experience is this: seven persons have been more or less connected with me in various parts of this inquiry, and I found that after a few days they all

acquired very fair knowledge; it was the want of a good set of specimens of ambiguous cases that prevented them from making further advance in that brief time. As an example of what has been done for me by others, I submit a small portion of the voluminous work by Mr. Collins, in which not only the A, L, W method of indexing was taken into account, but the particular pattern in a series of 53 standard patterns, which is a far more difficult task, yet he acquired the art very quickly.

196. Is this outline necessary in working these finger-marks?—I think not, if the A, L, W method only is used.

197. A learner ought to practise it?—A learner ought to practise it a little. It must be recollected that I wrote my book on finger-prints, in which the importance of outlining was emphasised, a year and a half ago, at all events, it was out of my hands 18 months ago, and I have studied the subject a good deal since; some things are now superseded that were said in that book.

198. You would dispense with the outlines except by way of practice in getting the forms into a beginner's head?—Quite so.

199. Then your method of indexing is taking the 10 fingers and appending to them the letters A, L, or W, according to the pattern of each?—Yes.

200. But on the forefinger you use the letters R and U according as it comes, R from the radial or thumb side or from the ulnar side?—Yes.

201. And that would give you possible combinations amounting to over 100,000 if they occurred quite indiscriminately?—With 10 digits their number is $4^2 \times 3^8 = 104,976$, say 105,000, with six digits it is $4^2 \times 3^4 = 1,290$, but only a fraction of the possible combinations are actually met with.

202. That is if they occurred absolutely indiscriminately?—If they occurred absolutely indiscriminately the 105,000 possible titles would be equally frequent.

203. But as a matter of fact, they do not occur indiscriminately or anything like it?—No. One combination is very common.

204. That is all loops. It occurs in about 6 per cent.?—Yes, that is the per-centage for "all loops" of the U kind only.

205. What is the reason of your making a distinction between R and U in the forefinger and not in the other fingers?—Because R occurs very rarely in any digit except the forefinger.

206. Very rarely?—Very rarely, and from trying to pick out the instances and finding so few the mind becomes lulled, as it were, with a sense of security and overlooks them when they do occur; for that reason I have thought it better to avoid them hitherto in my particular way of working.

207. In fact it adds very much to the labour of getting correct formulæ without really assisting the classification very much?—Quite so; that is the reason why I have discarded it, but I am not at all clear that I should recommend the same plan as that which I have used, for your purpose. I think it might be better to do away with the letters R and U, and to substitute for them other letters that mean respectively sloping downwards from the upper right-hand corner of the paper to the left-hand lower corner, or vice versa. It would be much simpler to get rid of the R and U, which have opposite significations in the two hands, and therefore strain the attention. In the way I now propose you would only deal with one signification. You would not care for the difference between radial and ulnar, but only for the direction of the slope, whether it was downwards to the right or to the left. The disadvantage would be that it is not physiologically accurate, but this is so only in appearance, because the way in which the title is written carries on its face its physiological meaning, telling which is the right and which is the left hand; if you desired to translate the title into R and U language, it could be done very easily.

208. I suppose you think it is desirable that we should take all of the 10 fingers; it very much increases the extent of the classification to take the whole 10?—On that point I have a misgiving; the gain is not so very great of 10 over 6 as it appears at first sight. Here you will find a number of the observed occurrences in a classification by six fingers.

209. Which are the six you take; the three first fingers of both hands, omitting the thumb and little finger?—Yes, the thumb and little finger sub-divide the rarer cases, but you may not want that particular kind of sub-division. If only six are taken it does not largely increase the number of the commoner cases. The commonest case, which is that of *ull, ull—ll, ll*, is raised from 164 out of 2,644 cases to 243. In other words it is only made half as common again. That is the only case which creates much difficulty if you are dealing with drawers that each contain not more than, say, 300 specimens, and I doubt if it is worth while under those circumstances to take the trouble of recording four more fingers.

210. Then you think, for the purposes we have in view, a record of six fingers would practically be sufficient?—If I understand your purpose rightly, that it is to divide primarily by measurement into 243 different drawers, so that each drawer shall contain not more than a few hundred cards.

211. Do you think the six fingers would work up to a thousand?—A thousand is rather large. The six-finger system would work even then if in the commoner cases the ridges in any one finger were counted or measured. I am a little doubtful about the advantage of indexing the whole 10 if you desire to expedite matters and secure the greatest economy of time.

212. You mean that the time taken occupied in taking the six fingers would be very much less than the time taken in taking the 10?—Yes; and there is also the largeness of the card.

213. There can be very little more time taken in putting down the five fingers than in putting down the three?—You have to roll them all individually afterwards.

214. (*Major Griffiths.*) The whole thing does not take more than a minute, does it?—If you do not fear the little additional time it is so much gained.

215. (*Chairman.*) It is only on the ground of saying time that you would take the six rather than the 10?—Yes.

216. (*Major Griffiths.*) It might lead to confusion—they might take wrong fingers?—Yes, certainly—it is better to have one impression at all events of the little fingers.

217. There is no fear about the time, it is a question of a minute, more or less. In taking the distinctive marks they sometimes occupy ten minutes?—A print of 10 fingers also means a large card, as you are aware.

218. We are glad of the other side of the card for the measurements and for the photograph?—Yes.

219. (*Chairman.*) What is the reason for not taking the formula from left to right?—The practice of beginning as I do, has grown into use for more than one reason peculiar to myself. Thus, I wanted many thousand prints from persons of different races, and the only chance of getting them was to ask for what could very easily be given. This led me to ask for the first three fingers of the right hand only, and so the practice of beginning with these was started. It has been persevered in, because of the great variety of pattern in the forefinger; it is the only one that frequently has an R. If you begin with the little finger nearly all your formulæ would begin with an L of the U kind.

220. Except a few W's?—Yes, but only a very small proportion of them and hardly any A's. I may as well now put in evidence a number of prints of palms and of complete hands.

221. But the palms must be a good deal more difficult to take than simply the finger-tips?—There must be a pad with a somewhat rounded surface to press upon, and soft paper like this should be used; it does not take much trouble.

222. Is it long since you took up the question of sub-classification?—In one sense I took it up from the very beginning.

223. But the mode of classifying by counting the number of ridges in the loop?—It was only when you met and asked me about sub-classification that I took it up in that way; I have counted ridges before, but not for the purpose of sub-classification.

224. But you think now that this sub-classification by counting ridges is the most practically useful one?—If the number of ridges in the first finger alone is counted, it would sub-divide the common titles into manageable groups, if you are only dealing with about 500 cases.

225. Take the ring finger, about how many classes would it give?—In the ring finger the number of ridges between the two selected termini (namely, the summit of the core of the loop and the place where the surrounding ridges diverge to enclose it), varies from 2 to 26 or more; the classes are about equally numerous between 3 and 16; there are thus fully 14 available grades.

226. Fourteen nearly equal classes?—Yes; if you counted to the nearest ridge there would be 14 classes and more; if you allowed for an error of one or two ridges, there would be say five very well-marked classes.

227. But perhaps the best way would be simply to arrange the cards in order of the number of ridges?—Yes; in order of the number of ridges in some one specified finger.

228. Then you would find the card somewhere near the place?—Quite so.

229. Do you think it needs a good deal more practice and skill to do that than to do the primary classification of A, L, and W?—It is extremely simple. The chief difficulty lies in the prints being on so small a scale that you require a lens, which some people may not be capable of using.

230. And can it usually be done pretty accurately?—Yes, I have found in going through a set of 164 cases of *ull*, *ull-ll*, *ll*, on which Randall and myself worked independently, that there were no cases of a discrepancy between us of more than two ridges; there were four cases, I think, of an error of two and about 18 of an error of one.

231. Generally speaking, you came very close?—Yes, we came very close when we had gained a mutual understanding about the exact principle by which the two termini should be chosen.

232. I think I have gone over all the points I have noted. We have one or two questions about Bertillon's system still?—I shall be glad to reply to them.

233. Before we come to that, are there any other remarks about the finger-prints you would like to make?—No, I think I have said all that I wish to say.

234. You have an arrangement by which you think it would be possible to take the finger-prints of a prisoner who resisted altogether?—I have.

235. Not fully worked out yet?—Not worked out on a resisting person.

236. But still you think it might be used?—I think so. I do not, however, rightly understand the degree and the sort of resistance to be feared. In experiments I have made with two small rollers set in a handle, one to ink the fingers and the other with paper round it to receive the impression a print can be obtained in an instant.

237. So that probably by holding the hand of the prisoner you might get the print?—I should think so. Another way would be to cut out holes or slits in a brass plate and to press the fingers upon them; then their bulbs would show through the holes and could be printed fairly well in that position.

238. Then, I think, you wanted to tell us something about the search of the cards?—*(The witness here explained a model of a drawer and cards, so arranged as to make it impossible to put any card in a wrong drawer in a cabinet of 243 drawers [vide Appendix H.].)*

239. You have also something to say about the use of a mechanical sorter?—I should just like to say a word about the possibility of hereafter using a mechanical sorter. I described one in my original lecture at the Royal Institution in 1888, and I find now that in the United States and at Vienna they use mechanical sorters in the Census Office dealing with many millions of cases. The use of the mechanical sorter is that it gets rid of all difficulty about transitional cases, and that it allows for a margin of error in measurement, also for the total absence of any one or more of many measures. *(The witness here explained the working of the mechanical sorter.)*

240. Then you have a criticism to make or some account to give of the degree of precision required for the Bertillon measurements?—Yes. I have been studying this subject, because it was stated in a memoir read before the International Congress in 1891, by Lieut.-Colonel Greenleaf and Major Smart, of the United States Medical Department (Trans., vol. IV., p. 294), that the

Bertillon method had been carefully examined for the purpose of identifying deserters from the United States army, but was not found suitable owing to the inaccuracy of the measurers. It will be recollected that M. Bertillon lays much stress on extreme precision. My results are not yet quite ready for publication, but they show that if any set, whether of the objects to be measured or of errors of measurement, be divided into three equally numerous divisions of small, medium, and large, and if the distance between the lower and upper limits of the medium division be, for brevity, called the "medium range," then if the "medium range" of the errors is not greater than one tenth part of the medium range of the objects measured, not more than 5 or 6 per cent. of the sets of five measures will be assigned to the wrong division. If the error is two tenths, a search will fail as often as it succeeds. It therefore is very necessary to exert all the precision attainable. I conclude from experiments in my own laboratory that the precision of this ratio of one tenth would be practically attainable.

241. In all the Bertillon measurements?—In respect to the four elements that I have been able to measure, namely, the head breadth, the head length, the cubit, and the middle finger. I have not measured the foot, because it requires stripping, which would be unsuitable to the publicity of my laboratory. I conclude that Bertillonage would be feasible if the measures were made with as much accuracy as at my laboratory, but it would fail if the measures were somewhat less accurate on account of the repeated references that would then be needed to conduct an effectual search.

242. By failing you mean to say that you would have to search in another division of the collection?—You would commonly find that your first search was incorrect, and a repeated search, once, twice, or more would be necessary. Precision is essential to success in search, though not absolute precision.

243. But a high degree of precision?—Yes.

244. Do you think that that degree is attainable for the four measurements which you have referred to?—Yes.

245. By ordinary measurers?—The measurers must be somewhat trained, but a small amount of training will do if they are intelligent.

246. The next point is the correlation; the effect of correlation upon successful classification?—It is a very important subject. If correlation is close, the advantage of using the correlated elements becomes, considerably reduced. I have worked out the theory of correlation in a Memoir read before the Royal Society, in 1888, where I showed that there exists what may be called an index of correlation. This may be taken to range between 0, which signifies complete independence, and 10, which signifies the strictest interconnexion. Thus the index of correlation between head breadths and head lengths is as low as 4 or 5. Between the middle finger and the cubit, it is as high as 8 or 9. Now when it is as high as 8, the available variability is reduced to about six-tenths. The subject is so very technical that it does not admit of a brief and full explanation, except in technical language; but you may take it for certain that when one limb is correlated closely with another, the advantage of using that second limb is small.

247. There is an instance of that, is there not, in this, that M. Bertillon now says that the little finger is so closely correlated with the middle finger that, after having made three divisions by means of the middle finger, he could not make three equal divisions by the little finger?—I should not be at all surprised. I should have thought the result would be worse than that. But now to give a practical application to what I said. Dr. Garson tells me that he has submitted to you a number of measurements of distances between the zygomatic arches. I do not know from my own experience whether that is an easy measurement to take, and I give no opinion upon it, nor whether emaciation or obesity would affect the measurement much; but this is certain, that it is much less correlated with breadth of head, and, so far as I infer, with other dimensions than almost any other measurement. The index of correlation between it and the head breadth is between 4 and 5, and its own variability is great, so that it appears to be a valuable measurement.

248. How would that stand as compared with the middle finger, supposing we substituted it for that?

—Subject to the reservation I began by making, I think it would be a very good substitution for the middle finger, but it would be advisable to measure the middle finger as well, in order to bring the set of measures *en rapport* for international purposes with those of M. Bertillon.

Mr. ANGUS SCOTT LEWIS.

251. (*Chairman.*) You are in the office of the Director of Public Prosecutions?—Yes.

252. You undertake the prosecution of cases all over England, I think?—Yes.

253. But principally in the Metropolis?—Well, no, all over England.

254. Amongst others you take up all coining cases, do you not?—All Mint prosecutions.

255. I suppose you find that coiners, as a rule, are people who very often come back again on one charge or another?—Yes, very frequently; more so I should think than for any other class of offences.

256. Do you find that there are often cases where the police fail to identify a man when he comes back on a fresh charge?—Perhaps I had better say I have been through the cases for the present year. Since the 1st of January 156 persons have been convicted of coinage offences; of those about 50 have been proved to be old offenders.

257. Their previous conviction has been proved in court do you mean?—Yes, and charged in the indictment.

258. But have you reason to think that a larger number really are old convicts?—Out of 156 I think that possibly six who were not proved to be old convicts probably were.

259. What reason have you for thinking they were old convicts?—By the way in which they committed their offence; they showed that they knew how coins could be passed most successfully.

260. But do you find in any of those cases after the convictions it has come out that the man was an old convict, or would you hear of that if it did occur?—I do not think we should hear of that; I cannot say that in any of those cases we have actually ascertained that they were old convicts.

261. But you are very strongly under the impression that there are some cases?—Yes.

262. Are there cases where a man commits an offence first in London and then travels to some provincial town, or travels from one provincial town to another?—Yes, the second offence is frequently committed in a different place from the first.

263. So that he would not come into the hands of the same police force?—Yes.

264. Are there any special instances you could give us?—A man was convicted not very long ago—during the present year, I think—at the Hertford Sessions, and in that case we suspected that he was an old convict, from the way in which the coins were uttered.

265. Did you make any investigations about it?—We made every inquiry we could to try to identify him, but we could not find out any thing before his conviction.

266. Do you not keep an album of photographs?—Yes.

267. But you cannot afterwards trace them by the photographs?—No. I should like to refer presently to one or two instances that I have got. After conviction this man gave certain information which enabled us at once to see who he was. We could not say that he was an old convict, but he was known to the London police as an associate of coiners in London.

268. But while he was waiting trial you had not been able to get any information about him?—No; he refused all information, refused to be photographed, and nothing could be traced.

269. I suppose in cases of coining like that, the fact of previous offences makes a great difference to the sentence?—Yes, peculiarly so.

270. In fact, it sometimes actually affects the character of the offence itself?—Yes, the first offence of uttering is a misdemeanor punishable with one or

249. But for cataloguing purposes you think it would be better?—I think so.

250. Assuming that the measurements could be taken accurately?—Yes.

two years' imprisonment as the case may be; whereas the second offence is felony punishable with penal servitude for life.

271. Then, it would be a distinct advantage to you in your work if we could establish some system which would make identification more easy and more certain?—Certainly.

272. (*Major Griffiths.*) Are we to understand that out of these 156 cases this year, 50 you identified, and 6 you had reason to suppose were convicts; are we to suppose that the other 100 were first offenders?—I think so.

273. (*Chairman.*) In any other class of cases have you come across instances where identity has been missed?—Well, there was a case that you know of here, the case of Blake.

274. Yes, we know the case of Blake very well?—I need not say anything about that case.

275. In that case the mistake was put right before he went for trial?—Yes, I think so.

276. It really originated in that case, did it not, from a warder making a mistake, or a police officer making a mistake, in the recognition?—Yes, more than one officer. On the question of mistakes, I do not know whether you would care to hear of a very recent instance of a mistake in a coinage prosecution.

277. We should very much?—No real harm was done. A woman has just been convicted at the Stafford Assizes for a coinage offence. She pleaded guilty, and after conviction a police officer stated that nearly 20 years previously she had been convicted of a coinage offence, in the name of S—H—, and sentenced to 12 months' hard labour. She did not deny it, but within the last few days we have been looking at the old papers, and I have here the photograph of the woman who has just been convicted, and the photograph of the woman convicted at the Stafford Assizes in 1874.

278. Was this previous conviction attributed to her when she was convicted the other day?—Yes, but it was not charged in the indictment. It was stated to the court after she had pleaded guilty.

279. Then do you think they are not identical?—I think not.

280. Do you judge by the photographs?—I have something else that I judge by. At the Stafford Assizes in 1874 another woman who gave the name of A—J— was convicted of a coinage offence and sentenced to the same term of imprisonment—12 months. Now that is the photograph of A—J— (*photograph shown*).

281. (*Major Griffiths.*) These are the same women, no doubt?—I think these are the same.

282. (*Chairman.*) Then the mistake, if it was a mistake, did not do her any harm?—No; as it happened it did not.

283. It was only one name instead of another?—Yes. Of course, as it happens, it is not a serious mistake, but it might have been.

284. It shows at any rate that you have no materials for absolutely establishing identity in these descriptions?—No.

285. Is there any other case that you would like to mention?—No. I cannot think of any other case that would be of any service to you. I may say we did not charge that conviction in the indictment, because it was so long ago.

286. Are there any other cases?—I can say generally we have had cases in which it is thought that the person has been previously convicted.

287. Without your being able to establish it?—Yes, but that does not occur frequently in other charges with which we have to deal.

Mr. EDMUND ROBERT SPEARMAN.

288. (*Chairman.*) You have made a special study of the Bertillon system of identification, have you not?—Yes, I began it in 1886, and I think it was in March 1887 that I made my first communication to the Home Office on the subject.

289. And since then you have occasionally worked in M. Bertillon's laboratory?—I should not have written to the Home Office if I had not thoroughly worked at it; I worked at it in 1886 for more than three weeks.

290. Just as if you had been one of the assistants?—I went through exactly the same course as an ordinary warder would. Since then the Ceylon Government sent over Dr. Thornhill to study it, and as he could not speak any French, I had another three weeks' experience there teaching him, and of course perfecting myself still more, so that I think I know the system certainly as well as any Englishman. Hardly a month passes that I am not in the Paris anthropometric bureau.

291. You have written on the subject a good deal?—I have written a good deal, both in the public press and in the different reviews.

292. There is one article of yours in "The Fortnightly"?—The first article is in "The Fortnightly" of March 1890; another one in the "English Illustrated" in October of the same year, which, by-the-bye, was the only guide that they had in Ceylon to work from, and then another one in the "New Review" of July of this year.

293. You were the person who first brought it to the notice of the Home Office I think in 1887?—I was; very much to my surprise I found that neither Scotland Yard nor the Home Office had heard of it.

294. That was in 1887, when it was comparatively a new thing in Paris?—It had been in practice five years.

295. The first few years were spent chiefly in taking measurements?—Still I thought there would have been a general sort of knowledge of what other countries were doing.

296. At that time it was only used in Paris?—It was only used in Paris at that time.

297. Since then it has been extended?—In 1888 it was made compulsory in every prison in France and Algeria.

298. But as a matter of fact in M. Bertillon's office, very few identifications are made outside the cases measured in Paris?—Well, a good many are sent up. Unfortunately in their statistics they have not got the records of the country identifications.

299. In 1892 there were six identifications outside Paris?—There were, yes. That is all for legal purposes, because Marseilles and Lyons have got anthropometrical as well as alphabetical collections, so that anything done there would not want to come to Paris.

300. That is, local criminals in Marseilles or Lyons?—Yes.

301. But the great merit claimed for the system is that a criminal can be identified anywhere over the country by that means?—Yes.

302. In that respect it has not led to very great results?—It might appear so from the figures, but from conversation with M. Bertillon I fancy that they do identify a great number. They certainly identify men who come from the country to Paris, because I have seen them. When Sir Charles Russell was at the office there was a man from Marseilles, whom he identified, who swore he had no convictions at all, and seven or eight were found against him. When he was asked why he had sworn that he had no convictions at all he said, "I denied it because I never was convicted in Paris; how was I to know that you knew anything about the Marseilles convictions?" Belgium and Switzerland have sent measurements of criminals to Paris and M. Bertillon has been able to give information regarding the antecedents of their prisoners. Lyons and Marseilles, being near the frontiers, anthropometry has been found of much use in reference to expelled foreigners.

303. Still, I rather gathered from M. Bertillon that he only searches in a country case when a special application is made to him?—Yes, he only searches where the *juge d'instruction* in the country asks him to do so.

304. (*Major Griffiths.*) Which is not very frequent, he told us?—Not very frequent.

305. Because they do not understand yet?—Because they do not yet appreciate it.

306. (*Chairman.*) As a matter of fact, it is not really in full operation?—As far as the country is concerned, it is not. There is a feeling of prejudice; there was a great deal of trouble when he started it, even in Paris. One thing which must eventually have some effect on the country people is the fact that the alphabetical classification has red cards in all cases of expulsion, warrants out, &c. notified by the authorities. When any such person is arrested and his card is sent up from the country, the Identification Bureau at once notifies where he is custody to the proper parties.

307. As a matter of fact, the provincial people do not believe in it?—No.

308. (*Major Griffiths.*) As soon as they get a certain number of cases they will believe it thoroughly?—As soon as they do.

309. (*Chairman.*) In the meantime a great many duplicate returns are accumulating in his office?—The more you have, the better.

310. I mean a man may be convicted, say, at Lyons, and then convicted again at Havre, and both returns come up to M. Bertillon's office; but unless his special attention were called to the case, they would be two separate cases?—He would find the first when he puts the second in the alphabetical classification. In the anthropometric classification he would note the first conviction on the second card and destroy the former.

311. He makes a certain allowance for minor errors, and these errors might separate the cards: a good many of them would be separated, because a good many measurements are on the margin of two classes?—That may be, but it is exceptional.

312. But when you have eight measurements, the chances are that in one or other of the eight it will be pretty near the margin?—The original one, the one taken at Havre, would be on the margin too; therefore, it would go into exactly the same place. Whether at Havre, Lyons, or wherever it is, it would have to be put in the same place.

313. The point is, on what you may call the margin, a very slight error of measurement in one direction or the other will put the card in the one box or the other; if you measure a millimetre more at Havre than at Lyons it will go into another box?—Yes, provided it was exactly on the margin.

314. In every case there are eight chances of that happening, because you take eight measurements.

315. Well, we have had some criticisms upon M. Bertillon's measurements. The things that are aimed at in the measurements chosen are first to have a measurement that is invariable in the individual, but that has got a considerable range of variation in different persons, and next, to have measurements which are not correlated to one another, and which are easily taken. Well, I think the first two, at any rate—the head measurements—answer all those conditions, do they not?—Yes; there is one thing I want to say about it, the anthropologists generally want to take the head length from the glabella.

316. What is M. Bertillon's reason for using the root of the nose?—One warder may take it from one spot, and another from another, and they may go higher and higher; there is nothing to guide them. Under M. Bertillon's system it must always be taken from the same place.

317. (*Major Griffiths.*) There is no fixed starting point?—There is no fixed starting point; the anthropologists, in some of the places where the system has been adopted, have taken to measuring from the root. Why anthropologists want it taken from the glabella is because it will supply them at the expense of Government with plenty of additional data. They know that if you take to measuring criminals right and left they will have more data than they are likely to get at their own expense.

318. M. Bertillon began by measuring from the glabella?—He did, but the warders were uncertain about the spot. The least variation would make a serious difference.

319. (*Chairman.*) Does he find that the middle finger gives a considerable range of variation?—Yes; and it is easy to measure accurately, that is, to a millimetre.

320. Then the little finger varies a good deal along with the middle finger?—The middle finger is more easily measured than the little finger.

321. He also takes the little finger for classes?—Yes.

322. He only divides it into two classes instead of three?—He takes the little finger to have sufficient measurements in case the numbers increased, because, as I have already stated, you cannot add.

323. But is it not the case that the cards in the drawer are divided by means of the little finger?—No.

324. I certainly understood that?—Yes; but first, by the height.

325. Second the little finger, and then the third the eye?—Yes; and then stretch of arms.

326. In this book which you gave me M. Bertillon says that now, instead of dividing into three divisions by the little finger, he now divides it into two on account of its varying so with the middle finger?—In a note on page xliii, he says he cannot divide the little finger into three approximately equal classes, the medium being the largest.

327. Then as to the eyes; he takes seven classes of eyes?—Seven classes of eyes. Well, the eye is a very important element, and at first sight it looks a very difficult thing to classify; but if you get the eyes in a good light it is a thing that is very easy to deal with. I have seen both foreigners and Frenchmen who have come to learn the system at first very much prejudiced against the eye classification, but after practice of four or five days they have quite seen the advantage of it. And if you are likely to send anyone over to Paris to study the system, before you give up anything, I should strongly advise you to see what the opinion of these warders may be after they have had experience there. Do nothing theoretically, but have the practical experience of two men who have been over there and learned. It is only the amount of yellow matter there is in the eye which is classed.

328. Does the amount of yellow matter make the seven classes?—Yes.

329. Then there are a good many cases transitional are there not; there are a good many cases where one warder would put it down as class number two, and another warder in class number three?—I do not think so. After all a mistake in that is not very important, as it is only the last division but one in the drawer.

330. It is not very far to go to the right one?—You have only to look through the seven, if you do not find the measurements come out in one class of eyes you go to the others.

331. Do you think it is necessary to retain the other measurements beyond those that are used for classification?—It is very easy to drop a measurement afterwards. The whole thing takes four to five minutes, the time you would save by dropping a measurement is not worth speaking of.

332. Why should we retain the measurements of the ear, for instance?—Well, you cannot add; when a man has once passed out of your hands, you cannot add anything to his description.

333. Yes, but what purpose does the measurement serve; it is not used now for the purpose of classification?—No, but you must look forward to having an enormous number.

334. We do not look forward to having nearly so many as M. Bertillon?—No, but you speak of years—eventually. Besides the ear is an additional test, it is one amongst the others on the card to show whether the cases agree.

335. If we take the finger-prints we shall not want that?—The finger-marks! I only say this, that during 11 years the Bertillon system has fulfilled all required of it. Why replace part of that system by something of which you practically know nothing, which at present is mere theory?

336. That would have been a reason at one time for not adopting the M. Bertillon system, would it not?—Perfectly; but now, at the expense of others, you are getting the benefit of their experience. May I just say, that in Berlin they have got a bastard Bertillon system? They had the prejudice that it was French. Their substitute has been a failure. In Italy they have tried the same thing; they tried additions and alterations. I saw a letter from the Italian Government the other day in which they said their system had failed signally, and that they are going to adopt Bertillonage *pure et simple*.

337. There is one thing I want to ask you about measuring in M. Bertillon's office. You have, say, 100 persons measured there in the morning. 50 of these perhaps at once admit that they have been measured before, and there is no difficulty about them; the other 50 are all measured, but is the search for former measurements made in every case?—Yes, the first thing is, if a man when he arrives gives a name under which he says he has been convicted, they look to the alphabetical list and they check him with a few measurements. Well, then with the others a search is made, because when they put the card away, they will find the other one in its place.

338. But do they make a search in every case to be sure that they have not the man measured previously do they make a complete search?—They measure him, and if he does not confess—

339. What I want to know is whether they make a complete search, supposing duplicate, or triplicate, or manifold search?—The search is practically made when the cards are put away.

340. I cannot admit that at all. I am perfectly clear that in a great many cases double, or treble, or multiple searches must be made. There are so many cases lying near the margin that it is perfectly clear that search must be made in two drawers, three drawers, or four drawers, so as to make sure they have no other man?—Yes.

341. I want to know whether there is such a search in every case, or whether they simply put away the card?—They simply put away the card.

342. They do not make a search in every case?—Not unless the police want to know who he is. You do not admit it, but I say that in putting the card into its place, the other will be found. I think you consider those on the margin are a good deal more than they are.

343. You mean they do not make these double searches unless they are asked to do it; they merely sort away their cards?—They merely sort away their cards.

344. (*Major Griffiths.*) They do not look to see whether they have got the card in another drawer?—They simply put that away. I should explain that of these 50 prisoners who do not admit a previous measurement, some 30 have generally been arrested in their homes, or been given into custody by employers or others, and their names are well known. The remaining 20 are always thoroughly searched for. In case of minors a thorough search is always made.

345. (*Chairman.*) Supposing a man were found to have been previously measured, I mean by a warder afterwards, does that count against the Bertillon system? If a man were identified by a warder, immediately the measuring officials are fined.

346. Are the measuring fellows fined in every case where they have a duplicate entry?—In every case where a man is identified after he has passed M. Bertillon they are fined 10 francs, five of which are paid by the man who has taken the measurements or made the search, if it is a case of search, and five are paid by the rest of the men in the room. But you will see the number in 1892, I think there were three cases.

347. Yes, but do they count it in every case where the card is in the registry at all, or only in cases where special search has been made?—In every case where a man is identified, the only way they can tell it is by his being identified afterwards. They cannot tell how many men have passed and not been identified; they have no means of finding that out, but the prison warders are all on the look-out to gain the 10 francs and so bring out any mistakes.

348. But in every case where a man is passed without being identified, and is afterwards identified in the prison?—Then they are fined.

349. I suppose you have been keeping a keen look-out have you not for any cases of mis-identification in this country?—Well, unfortunately living abroad I do not get much chance of seeing them, it is only in the public papers, and I may not have spotted some. I think I have one where a question was asked in the House of Commons. "In 1887 attention was called in the House of Commons to a case at the Middlesex Sessions, 'where a detective, although closely pressed by counsel, persisted in identifying a prisoner as having been previously convicted in the name of Reeves, until the real Reeves was produced in court, when he confessed his error.'"

Then in 1888 Lord Coleridge called attention in the House of Lords to the case of a man convicted before him at Gloucester Assizes for some slight offence, when a Metropolitan constable swore to his identity with a man previously convicted who, it was afterwards ascertained, was not the prisoner. There was a difference of I do not know how many inches in his height. I have the full particulars of all these cases. I have got the newspaper cuttings; I can give you them. Well then there was a very good case, "In July last (1889) the case was mentioned in the House of Commons where a previous conviction of a prisoner in 1879 with a sentence of seven years' penal servitude and seven years' police supervision was proved to the satisfaction of a jury by a warder who had compared the prisoner with the official description of the man so convicted; it was subsequently proved by police and prison warder's evidence, that the prisoner was convicted in 1882 of a minor offence, and therefore could not be the man convicted in 1879, who would still be under police supervision." He was convicted at Brighton in 1882, and yet the warder swore that he had got seven years in 1879; I think he was a pretty clear case. Then there was "In May last (1889), David Callaghan, after having two remands of a week each was committed for trial and was sentenced to six months' hard labour as an incorrigible rogue and vagabond on the evidence of a mendicancy officer and police constable, who swore to him in mistake for a man who had been frequently convicted. In prison he petitioned the Home Secretary, who after investigating the circumstances which led to his conviction liberated him," but he had suffered 12 weeks' hard labour. "The constable identified a prisoner as having been previously convicted, and the authorities on his evidence, were taking proceedings against the prisoner for having failed to report himself, but he proved that at the time the constable swore to his conviction in one town, he was in prison in another town miles away." That I think you will find in the Convict Supervision Department; they will give you all the particulars in that case. But they were actually proceeding against him for being on license and not having reported himself. That is all unfortunately I have been able to gather; these were all previous to 1890.

350. (*Chairman.*) There was one point I forgot to ask you about, namely, the arrangement of the cards. M. Bertillon now divides them into periods of 15 years, according to the date of birth, does he not?—Yes, but I spoke to him the other day and he strongly advises no attempt at that being made, because he says that is a thing you can always do later.

351. It involves as a matter of fact a great deal of additional labour?—Yes. It is very necessary when

you have a large quantity, but it is not necessary now. In sorting away the cards in France there is the *état civil*. You have nothing here to check a man's age with, but by the *état civil* in France; they can always check it.

352. (*Major Griffiths.*) That is supposing they can find out who he is?—Supposing they can find out who he is.

353. In France where they catalogue every birth it is easy enough to; here where the population increases by leaps and bounds, the test of age always is fallacious?—Oh, yes.

354. Does not this arrangement frequently lead to a card being put in the wrong cabinet if a false age has been given, and the age is on the border?—Yes. M. Bertillon is strongly against your attempting it at present.

355. (*Chairman.*) Supposing the years from 1830 to 1845 make one division?—It might be; I do not know what they are.

356. Supposing a man gives his age as born 1844, do they sort away his card in that cabinet without having looked to see whether he was born in that year or not?—M. Bertillon is now working his system in connexion with the *Sommiers Judiciaires*, of which he has made the head.

357. It may be useful for the purpose of weeding out the old cases over 50 and over 60?—Gradually to weed it out, when you get your numbers very large; but it would be years before you want that. It is only to weed out the old ones; it is not to look for them, merely to get rid, to put away men who must be dead and gone. In the *Sommiers Judiciaires* they found records of men who were 110 years old.

358. (*Major Griffiths.*) He had been 110 years?—He would be 110.

359. They were not living?—Somewhat like annuitants one has heard of.

360. (*Chairman.*) I think those are all the questions which I have got specially to ask you; I do not know whether there is anything that you want to state?—No; having communicated so fully with the committee in Paris, and by letter, I will ascertain the exact number of identifications in cases measured outside Paris.

[*Mr. Spearman has since sent the following note:—*
"The number of cases identified by measurements outside Paris in 1892 was 63, and not 6. By a clerical error in the figures furnished to me the 3 was dropped, thus reading 6 instead of 63."]

Mr. CHARLES STEWART MURDOCH, C.B.

361. (*Chairman.*) You are head of the Criminal Department at the Home Office?—I am.

362. And all the petitions from all the prisoners in all the prisons of England go through your hands?—They do.

363. You see every one of them?—I see every one of them, I may say.

364. If any considerable number of prisoners complained of being wrongly identified as old offenders, you would necessarily see them in every case, would you not?—Certainly I should.

365. You have in the course of the year several thousand petitions?—Yes, that is so.

366. And do you find that there is any considerable number of them complain of being wrongly identified?—No; certainly as far as my official memory goes, it is quite the contrary. We have many petitions from persons who protest their innocence, but very few indeed who have ever protested that their previous convictions have been wrongly recorded against them. We have had a few cases, and some of them somewhat curious ones.

367. Generally there has not been much difficulty in settling the case one way or the other?—That is so. I have an instance here, a very curious instance of a certain man who protested against the previous convictions, recorded against him, one Thomas Williams. He was reported to the Home Office in February in 1885, as being identical with an old convict of the name of Walters or Evans. This man denied his previous

convictions. The Home Office in looking over the case found the convict was positively identified by officers at Pentonville and Portsmouth as Evans; nevertheless, as he protested so strongly, it was thought well to refer to the judge. The judge reported that he had examined the evidence of identity at the time of the trial, and he thought that Evans was not the same person as Williams. Well, the Home Office was still not satisfied that he was not the old convict—the question of forfeiture of license was involved—and I think it was your present chairman who suggested that a comparison of the handwriting of an old petition with the writing of the petition in which he protested against the injustice of his previous convictions should be compared. The extraordinary resemblance between the handwritings in the two petitions was such that by Sir William Harcourt's direction, we wrote to the judge pointing this out and sending him the petitions. The judge was convinced, and finally this convict was held to serve the unexpired portion of his former sentence, so that you may say that this case shows that the examination at the Home Office had successfully tested the correctness of the identification.

368. Speaking generally, you do not think there is reason to think that there are any prisoners undergoing long sentences on account of convictions being wrongly attributed to them?—So far as I know, certainly not, and I think that they are so very willing and ready to protest against any injustice, fancied or real, that we should certainly have had petitions from anyone in that position.

369. Well, then on the other question of identifications being missed; that would chiefly come before the Home Office, would it not, in the case of license-holders being re-convicted, but not identified at the time as being license-holders?—Yes, certainly.

370. Because every question of the forfeiture or revocation of their license goes through your Department?—Quite so.

371. Do you find there is any considerable number of cases where it turns out on conviction that the man had been a license-holder?—I could hardly say a considerable number of cases. I have got some figures—which, though not complete statistics, will give you some idea of the number. They have, prepared by Mr. Wheeler, and they all relate to cases that have occurred during the present year. He has examined 72 cases in which license-holders were convicted summarily either of indictable offences, or of frequenting with intent to commit felony. In 33 cases they were known to be license-holders at the time of conviction, in 9 cases they were not so known. In the remaining 30 cases we have no definite information as to whether the identification was made before or after the conviction, but it is to be presumed that in most of them it was after conviction, for in 29 of the 30 cases the clerk of the court did not report the conviction as he was bound by Act of Parliament to do if he knew the man to be a license-holder. Among license-holders convicted on indictment the proportion of identifications is larger. In 103 cases, 88 were recognized before conviction and 5 after. As regards the other 10 we have no information as to where they were identified. Of course these figures cannot take any account of those who escape identification altogether—are not recognized at all. They only refer to cases recognized—and show that in some cases the recognition is not made till after conviction. Curiously enough, one or two very striking cases of this sort—in fact, more than one or two—have happened quite lately; I do not know whether you would care to have the particulars.

372. I think we might have them. Those are cases under consideration in the Department at the present moment, are they?—Yes, going on in the Department now. Here is one, Charles Edwards or O'Brien, who was convicted at the Middlesex Sessions, August 1888, of larceny from the person, and sentenced to five years' penal servitude. That convict was released into the Metropolitan Police district by license dated 25th May 1892. He was convicted at the Middlesex Sessions in October 1892 of stealing 74*l.* from the person. That shows that it was a considerable offence, and he was sentenced to 12 months' imprisonment. He was not recognised as a license-holder at the time, and in consequence, the forfeiture of his license was not exacted, and he did not pay the penalty of such forfeiture.

373. You have just discovered it when it was too late?—Yes.

374. (Major Griffiths.) What sentence did he get?—He got 12 months for that other offence; he was under an alias of Clancy. That is one case.

375. When was it discovered that he was a license-holder?—Just the other day, after his release. He was charged with not reporting while on license, and then it was discovered that the reason why he did not report was that he had been in prison under another name.

376. Then here is John Clayton, another case. Original sentence five years for larceny, at the Middlesex Sessions, in 1888; released in August 1892, into the Metropolitan Police district. Convicted at the Mansion House, October 1892 for stealing a watch; sentenced to six weeks' imprisonment; he was only recognised after conviction but in time to secure the revocation of his license. His license was revoked and he served his remanet, but earned the usual remission of one fourth, and was again released on license.

377. Both these men would have gone to Holloway, sent to Holloway for trial and seen by the police and warders?—Yes.

378. (Chairman.) That man was again convicted?—He was again convicted in February 1893; he was again recognised only after conviction, and this time too late to revoke his license.

379. That is twice at the Mansion House within the year?—Yes, both times convicted without being identified. Then there is a third case much the same, George William Hammond, originally sentenced at the Central Criminal Court for forgery in 1888 to five years' penal servitude; released on license into the Metropolitan Police District in June 1892; convicted in November 1892 of uttering a forged request for goods, not recognised then; he was again convicted at the Central Criminal Court in September 1893 for forgery and had 12 months; not recognised before conviction. His case rather difficult to explain. He had incurred forfeiture of his license by his conviction in November 1892; but as it was not discovered that he was a license-holder the penalty of the forfeiture was not exacted at the time, and now it cannot be exacted on his second conviction in September 1893, because the forfeiture having been incurred at the previous conviction, there is now no license to forfeit. It is a very technical point, but the result is clear. In consequence of the failure to recognise him as a licence-holder he has escaped the penalty due.

380. Do you think of anything else?—No, I think you have everything I can tell you. I could only say generally that any addition of a new system to the old which would ensure the absolute certainty of identifying old offenders—I mean to say a more perfect registry which would enable the County or Metropolitan Police to identify at once by marks or measurements old convicts and license-holders would be cordially welcomed.

381. Especially to spot them all over the country wherever they go?—Yes; that of course is most important.

Home Office, Thursday, 1st February 1894.

PRESENT:

Mr. C. E. TROUP (Chairman).

Mr. M. L. MACNAGHTEN.

Mr. H. B. SIMPSON (Secretary).

Professor ARTHUR THOMSON.

382. (Chairman.) You are Professor of Human Anatomy in Oxford University?—Yes.

383. At the request of the Committee you have prepared a report on the anatomical aspects of the Bertillon measurements of the head?—Yes. I hand in that report.

384. The question I asked you to deal with in that report, was not so much the possibility of practically using Bertillon's measurements—we assumed that ex-

perience had proved that—as whether the margins he allows for error were sufficient?—Yes, it is the question of the sufficiency of the margins that I deal with.

(Report handed in.)

Department of Human Anatomy
Museum, Oxford,

January 26, 1894.

SIR,

In compliance with your request, I have much pleasure in submitting the following statement.

In regard to the measurements of the length and breadth of the head as suggested by Bertillon, I consider that the limit of error (2 millimetres) is too small to apply with absolute certainty in all cases.

My reasons for holding this opinion are:—

- I. That even amongst experts, when measuring skulls, on which of course there are no soft parts present to further complicate matters, there is frequently a difference of from 1 to 2 millimetres between the measurements of different observers. Such being the case with macerated specimens, it seems to me the sources of error in measuring the living are likely to be much increased.
 - II. Because on the living the accuracy of the measurements of different observers will much depend on the amount of pressure employed, thus leading to the compression of the soft tissues, and so interfering with the constancy of the results. This difficulty, however, might be overcome by the use of an instrument provided with a spring which would regulate the pressure, and so yield more or less constant results.
 - III. Because of the tissues themselves, which are liable to undergo atrophy and thinning as a result, either of disease or advancing years. It is a matter of common knowledge that the scalp of an old person is much thinner than that of an adult. The wrinkling of the skin of the forehead in the aged is an indication of such changes, and is in part a result of this atrophy.
 - IV. Because in addition to the ordinary tissues of the scalp (skin, fat, and fibrous tissue), there may be a source of error in the width measurement of the head due to the presence of the temporal muscle (one of the powerful muscles which raises the lower jaw).
- I have made a number of measurements to ascertain the maximum width of the head in European skulls, and in the majority of cases, the greatest breadth of the bony walls of the cranial box, was found to fall within the limits of the temporal fossa, the area from which the muscle aforementioned takes its origin.
- Thus the measurement of this diameter may be influenced in one or other of two ways:—
- (a.) Either by alterations in the development of this muscle at different periods of life;
 - (b.) Or by the contraction of the muscle itself, which produces a thickening of its substance.
- I have in this way (b.) been able to produce a difference of 2 millimetres in the measurement of this diameter in some individuals whom I examined.
- V. Because, since the introduction of Bertillon's system 10 years ago, there has been no opportunity of testing the changes which may be produced by age. In other words there is no proof that the measurements taken from an individual at the age of 25 may be relied upon as absolutely accurate as a direct test to the same person at the age, say, of 60 or 65; bearing in mind always that by this system the range of difference allowable in these measurements is only 2 millimetres.

With a view to obtain further information on these points I would venture to suggest two lines of inquiry:—

- (a.) That a series of measurements should be taken by competent observers from time to time in hospital from patients suffering from acute wasting diseases. This need not entail any inconvenience to the patients.
- (b.) That observations should be made in the post-mortem room as to the thickness of the tissues involved in these measurements, at different ages, and on the bodies of those who have died in different degrees of emaciation.

It is difficult to say what one may regard as the normal thickness of the scalp, that must vary with the individual; nor is it easy to say what may be the extremes of difference without some further facts to go on. Yet I can easily imagine that at different periods in the life of an individual we may get a greater difference than that covered by a limit of error of only 2 millimetres.

There would doubtless be evidence of wasting and emaciation in other parts of the body, and no doubt an accurate observer would note these facts; but more reliance could be placed on the results if taken in association with the body weight at the time of observation, any marked variation in the body weight being taken as an indication of increase or decrease in the bulk of the tissues of the body.

The bi-zygomatic width is open to fewer objections than the breadth measurement of the head, because the tissues overlying the bone are less dense, and do not include muscular fibre, and thus the measurement dependent on the osseous form may be more accurately obtained. This measurement appears to me a good one, it is not correlated to the width of the cranial box, but depends on the form and development of the bones of the face.

The width of the bony pelvis is not likely to undergo much variation with advancing years, but here again the tissues overlying the bones may differ considerably in thickness according to the age and development of the individual, here, however, we have to deal with a greater diameter, and the range of error need not necessarily be so limited. Whatever the variation in man, it would probably be greater in woman, in whom the subcutaneous tissues are much more fully developed in this region, than in the male.

It seems to me that whilst those measurements (the bi-zygomatic and pelvic widths) may be useful as accessory measurements, it would be unwise to substitute them for the measurements recommended by Bertillon, as such a change would necessarily interfere with the international application of the system at present under consideration.

I have, &c.

ARTHUR THOMSON.

C. E. TROUP, Esq.,
Home Office.

385. (*Chairman.*) Your main point then is that for head measurements Bertillon's limit of 2 millimetres is too small?—Yes, I think it is too small.

386. Bertillon gives a "theoretical margin" of 1 millimetre only. Your criticisms would apply more strongly to this—Yes. I think 2 millimetres is too narrow a margin. We have no evidence to prove that these measurements can be relied upon if applied to persons of advanced age or to persons suffering from wasting diseases.

387. Supposing we made it a 4-millimetre margin for old persons?—Probably that would sufficiently cover these cases.

388. And we might have it specially stated in the rules that when a person in an emaciated condition was measured, a note to this effect should be made on the card, so that if necessary the double search might be made within a wider margin than the ordinary one?—That might be done, but with regard to emaciation I think that it should be recorded by weight, because one may examine a criminal and may never have seen him before, and one does not know what his physical condition was at that time. His present weight might be compared with his former weight.

389. That assumes that you know your man, but the difficulty is to find him. For that the only course is, I think, to allow a wider margin when there is apparent emaciation?—No doubt that is so; but when the case was found the difference in weight would explain the discrepancy in the measurements.

390. I will now go through the points in your report. You first mention discrepancies in measurements of skull by experts. What experts do you mean—experts in anthropology or in measuring?—I mean both—anthropologists accustomed to and trained in measuring skulls.

391. Might not errors arise from taking measurements in different ways or with different instruments?—They might, but the rules for the scientific measurement of skulls are very definite.

392. Would they not be avoided if measurements were taken according to fixed rules like M. Bertillon's?—I do not think M. Bertillon's rules could be more precise or definite than those used in taking these scientific measurements.

393. What instruments were used, callipers with flexible legs, such as you showed me in Oxford?—Yes, these and Professor Flower's craniometer.

394. M. Bertillon's callipers (*showing them*) are much more rigid than those you showed me?—Yes, in that respect they are better.

395. Bertillon found considerable errors occurred in the measurements when he took the head length from the glabella, but not to the same extent when he altered the place and took them from the root of the nose?—Yes. I think for your purpose it is better to take them from the root of the nose. For scientific purposes I should be glad to have them from the glabella. But for your purpose the other point is more easily fixed, and therefore better.

396. You refer next to the amount of pressure employed. We found when we tried measurements in M. Bertillon's office that we could easily distinguish 1 millimetre too much and 1 millimetre too little. If the callipers were a millimetre too wide, it did not touch the skin; if it were a millimetre too close, it pressed hard. Does your experience contradict this?—Well, I have tried some medical students in making the measurements; they were intelligent men and accustomed to use their hands.

397. And you found errors?—I found variations exceeding 1 millimetre, *e.g.*, the measurements of one head were 198, 194, 194, 193. (198 would be an obvious blunder.) Another 193, 192, 194, 192, 193. In this case you see there is a variation of 2-millimetres.

398. Had they no sort of standard to go by as to the amount of pressure?—They had the rules laid down by Bertillon.

399. Were these men trained in head measuring?—No; it was their first attempt.

400. M. Bertillon thinks three weeks' regular training is necessary?—No doubt that would make a difference.

401. You suggest that a spring should be used to give a uniform pressure?—Yes.

402. Could you rely on a spring always acting uniformly, in different instruments and at different times?—I think so. It is used in India.

403. In neither of the classes of cases you mention does the variation exceed the 2-millimetre margin. We now come to the points which you think might lead to that margin being exceeded. The first that you mention is that the tissues of the scalp are liable to undergo atrophy?—Yes; I show these models (*models exhibited*). These are taken from actual heads. They were made for a quite different purpose, but they show clearly the thickness of the scalp. One is a young person, the other a person about 70. You see the great difference in the thickness of the scalp.

404. What is the cause of thinner scalp in old age?—It comes mainly from the absorption of the fatty tissue. There may also be wasting of other tissue. I show a specimen of scalp kept in spirits (*showing specimen*). There is first the skin, then fatty tissue mixed with fibrous tissue, then tissue connecting with the bone. You see there is a good deal of thickness of fatty and fibrous tissue. In disease or in old age the fat is absorbed and the scalp becomes thinner.

405. Could it not always be noted if prisoner had an emaciated appearance, and additional allowance might be made for this?—Yes; that might be done.

406. If the margin for error were 2 millimetres, but all cases where prisoner looked emaciated were noted, and an additional margin, say 3 or 4 millimetres were allowed for the searches in these cases and in all cases of old persons, would not that remove to a great extent your objection?—Yes, that would be a practical way of meeting the difficulty; my point is that scientifically a 2-millimetre margin is not sufficient for all cases.

407. We come next to the *muscle*. In the majority of cases you say that the point from which the head width is taken lies over the temporal muscle?—Yes; I have found by experiment that in the majority of cases the maximum width falls within the area of attachment of the temporal muscle. That might be a further cause of error if there were growth or reduction of the muscle. But I qualify this by saying that usually on the point where the measurement is taken the muscle is very thin.

408. So that usually it would not much affect the measurement?—Not very much.

409. Would the muscle develop much in persons over 21 years of age?—No, not much; only very rarely and

in very exceptional circumstances. What I should rather fear would be the effect of its reduction or atrophy.

410. In old age or from disease?—Yes, in those cases muscle would waste with the other tissues, and would increase the variation already spoken of.

411. But in a person in ordinary health, within a period say of five years, there would not be much change?—Not much, not any appreciable change I should think.

412. Then as to the alteration caused by voluntary contraction of the muscle: that would be in shutting the mouth?—Yes, shutting the mouth and clenching the teeth.

413. The prisoner might slightly alter the measurement in that way?—Yes.

414. But if this were tried it might be met in the same way as other attempts at trickery in other measurements?—Yes, but it might be difficult to observe, unless the attention of the warder was particularly directed to it. Asking the man to whistle would be a means of preventing him from clenching his teeth.

415. (*Mr. Macnaghten.*) Bertillon finds greatest width of skull *above* and slightly *behind* the ear; does the temporal muscle reach *above* the ear attachment?—Yes, but, as I said, usually on a point where the muscle is very thin.

416. (*Chairman.*) Do different races differ in this respect?—Yes, that is a point of difference.

417. Do you think there would be any alteration in the bone in adults or only alterations in the muscles suggested above?—It is impossible to speak with certainty of the bone. Scientific measurements extending over all periods of life have not been made, but certainly if there is any alteration, it is so small that for your purpose, it might safely be neglected. I do not think that the change is likely to interfere with the accuracy of the measurements. I think that you have proof of that already; the Bertillon system has worked very well. I cannot however accept this as sufficient proof of its applying in all cases.

418. And any question of alteration in the bone only affects a long term of years, whereas our prisoners are mostly to be re-identified within a short period?—Yes.

419. Have you measured the thickness of any scalps?—The specimens I show you vary from 3 to 8 millimetres. These are taken from various parts of the head. The thickness of the scalp varies in different parts. I hand in two tracings which will show in these cases the thickness at the points of measurement. (*Tracings handed in of sections of heads which showed thickness of scalp (skin and tissues) at the back of the head about 8 millimetres and at the root of the nose about 4 millimetres.*) I cannot say what the normal thickness would be. I have in my report suggested experiments which would show the extremes of possible variation.

420. Would not measurement of persons suffering from acute wasting diseases be misleading? Criminals are not usually in this state?—I only suggest them as showing the extremes of possible variation, not as fixing the rule for ordinary practice.

421. Generally would a margin of 2 millimetres cover the variation in ordinary cases where there is careful and uniform measurement, no long interval of years and no noticeable emaciation?—Yes, I think so. At any rate that would be a very different thing from saying that the variation can never exceed 2 millimetres.

422. You suggest the width of the face, the "bizygomatic width," as a good measurement. Do the tissues there really interfere less with the measurement than on the scalp?—Yes, the tissues are softer and the bone found more easily.

423. But that implies some pressure in making the measurement?—Yes, there would have to be some pressure not mere touching of the skin. In this case a spring should be used which would give an appreciable pressure uniform in all cases.

424. How is this measurement affected by the difficulty of finding the position for measurement?—It would not be difficult. You place the callipers in front of the ears and draw them forward till you reach the maximum.

425. On the whole are you in favour of anthropometry?—Yes, strongly. I think its principle is right,

and I think the particular measurements suggested are good ones. But I think the margin proposed to be allowed, if it is to be applied to all cases, is insufficient.

426. When M. Bertillon (Introduction, p. xxvi.), says that 2 millimetres is the limit of gross errors, beyond which one may infer *non-identity*, you object to that?—Yes, I object to that. I say that even with accurate measurements cases may occur of greater variation than 2 millimetres.

427. But these would be extreme cases, after long intervals of years, or in case of wasting disease such as consumption?—Yes.

428. Most identifications have to be made within a year or two of prisoner's release, many within a few months. An identification after ten years would rarely

be required. (*Mr. Macnaghten.*) We should never want to identify after 30 years. (*Chairman.*) Nor should we often have to deal with a man suffering from wasting disease. So that in practice we should be able in most cases to disregard the extreme variations?—Yes.

429. Your argument points merely to the rules as to margins being settled carefully on a scientific basis?—Yes.

430. And the Anthropometric Registry should have scientific advice as to the exceptional cases that might occur?—Yes, that would be required.

431. But with proper safeguards you think Bertillonage practicable?—Yes, certainly. I think it most desirable that it should be adopted in some form.

APPENDICES.

APPENDIX A. (1.)

CIRCULAR OF 31ST OCTOBER 1893.

Home Office,
October 31, 1893.

DEAR SIR,

A SMALL Committee, of which I am secretary, has been appointed by the Home Secretary to consider the present system of identifying old offenders when arrested by the police, and to report to him what practical measures can be adopted for improving it. For this purpose the Committee would be much obliged for any observations you may be able to offer on the subject, and especially with regard to the following points:—

1. What are the methods actually employed by members of your force for identifying persons in their custody who are not personally known to them but who are suspected of being old offenders.
2. What use is made of the printed registers of names and of distinctive marks issued by the Habitual Criminals Registry, and whether they are frequently the means of establishing the identity of offenders.
3. Whether more identifications are effected through the agency of the "Police Gazette," the Illustrated Circular issued to subscribers from the Criminal Investigation Department at Scotland Yard, or the "route forms" sent to prisons and to other police forces.
4. Whether you consider the means at present available are sufficient to ensure habitual criminals being identified in the majority of instances should they be apprehended within your district; and

Whether you can form any estimate of the number not identified who, in the absence of information respecting their antecedents, are dealt with as if for a first offence.

5. Whether in the case of criminals charged by your police before the magistrates who are not identified but are suspected of being old offenders it is the usual practice to ask for remands, so as to obtain time to make inquiry by "route-form" or otherwise, or whether such inquiry is more commonly made only after a prisoner has actually been committed for trial.
6. Whether you have any definite suggestions to make for putting the police in a better position for keeping habitual criminals and those who make a living by dishonesty under their supervision.

My Committee would be very glad if you could let them have your views not only with regard to your own force, but with regard to any other forces, of which you can speak from experience.

Yours faithfully,
H. B. SIMPSON.

[This circular was issued to the Commissioner of Police of the City of London and the Chief Constables of the counties of Hereford, Somerset, Sussex (Eastern Division), Stafford and Worcester, the three Ridings of Yorkshire, and the boroughs of Birmingham, Bradford, Bristol, Doncaster, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Portsmouth, and Scarborough.]

ABSTRACT OF ANSWERS RECEIVED.

1. Most forces attach the highest importance to route-forms as a means of identifying suspected persons, whose identity cannot be locally ascertained, if photographs of the suspected persons can be obtained for circulation.

The Chief Constable of Bristol and the Commissioner of the City of London Police, however, do not speak of issuing them, except in the latter case to the Metropolitan Police, and the Chief Constable of Hertfordshire does not consider them so useful as other agencies for identification.

The Chief Constable of Leeds says:—"The principal and almost only useful means of identifying prisoners

"are through the photographic route-forms sent to prisons and to other police forces."
The Head Constable of Liverpool says:—"The route-forms are found to be of the greatest value."
The Chief Constable of Somerset says:—"More criminals are identified through the route-forms than through either of the other means mentioned."

2. The opinions expressed as to the value of the volumes issued by the Habitual Criminals Registry are as follows:—

BIRMINGHAM	- "Have on many occasions assisted us materially."
BRADFORD	- "Is a matter of reference only when all other means have failed."
CITY OF LONDON	- "Used for reference, but not considered of much value in its present form."
DONCASTER	- "Have succeeded in a good many instances."
HERTS	- "Is referred to," but does not frequently lead to identifications.
LEEDS	- "Of little or no use," "sometimes (though rarely) referred to."
LIVERPOOL	- "Frequent use is made," "identifications frequently" established thereby.
MANCHESTER	- "A few cases have been traced by means of it."
NEWCASTLE-ON-TYNE	- "Frequently examined . . . occasionally with success."
NOTTINGHAM	- "Useful for reference, although not many persons are identified" thereby.
PORTSMOUTH	- "Their use has not been very productive."
SCARBOROUGH	- "Occasionally the means of identifying offenders."
SOMERSET	- "Cannot say they are frequently the means of identifying offenders, though this is the case 'from time to time.'"
STAFFORDSHIRE	- "Are valuable 'in practised hands,' 'in constant use' at headquarters, but not much used in divisions."
EAST SUSSEX	- "Very little use;" "seldom the means of establishing identity."
WORCESTERSHIRE	- "Do not think they are often the means."
YORKS, E. RIDING	- "Sometimes the means,"
N. RIDING	- "Have not as a rule had occasion to use" them.
W. RIDING	- "Not found to be of much service."

3. Value of the "Police Gazette" and the Illustrated Circular issued by the Convict Supervision Office as means of identification:—

BIRMINGHAM	- The Gazette "affords some assistance"; the Circular has "on many occasions assisted us materially."
BRADFORD	- They "are of little or no use . . . in this part of the country."
BRISTOL	- "All these means have proved of great service."
DONCASTER	- "Have both answered the purpose [of establishing identity] on more than one occasion."
HERTS	- "Most identifications are obtained through the Police Gazette, but the Habitual Criminals Register and the Illustrated Circular are found to be most useful and valuable."

- LIVERPOOL - - - "Very few identifications" effected thereby.
- CITY OF LONDON - "Most identifications are effected through the Illustrated Circular."
- NEWCASTLE-ON-TYNE "Hardly any are identified through Police Gazette. The Illustrated Circulars should be useful. . . . but they chiefly refer to south country thieves who but seldom visit us except during "race meetings."
- PORTSMOUTH - "Comparatively few" identifications through the Gazette. The Circular would be more valuable "were its scope extended and its issue more frequent."
- STAFFORDSHIRE - Both are "in their way of considerable value, the Police Gazette especially so. The Police Gazette would be of much greater value if published more frequently."
- WORCESTERSHIRE - "Both very useful." In the Circular the photographs of criminals of one class (e.g., burglars, horse-stealers, &c.) should be grouped together.

4. The answers given to the question whether the existing means of identification are sufficient, are mainly in the affirmative, but in quite general terms. On the other hand the Chief Constable of Doncaster says, "The means at present available are not in my opinion sufficient to ensure the majority [of old offenders] being identified. I cannot form any reliable estimate as to the number who escape identification here, but feel confident a large number of those arrested and dealt with summarily during the race meetings are old offenders from all parts of the country who give false names and refuse their addresses." The Chief Constable of Manchester says, "I do not consider the means at present available sufficient to ensure habitual criminals being identified in the majority of instances." Of the West Riding Constabulary the Superintendent of the Doncaster Division says, "They [habitual criminals] are not identified in the majority of instances." The Superintendent of the Selby Division says, "The means at present available are not sufficient," and the Superintendent of the Tadcaster Division says, "The means at present available are not sufficient to ensure habitual criminals being identified in the majority of cases, in the absence of photographs."

The Chief Constable of Newcastle-upon-Tyne observes, "The means at present available should be in most instances sufficient, but I have reason to fear that too often this highly important duty is performed in a perfunctory manner. I find it difficult to teach the provincial police to appreciate these duties, the successful performance of which so much depends on strict attention to matters of minute detail."

The Chief Constable of Portsmouth says, "These agencies are not in my opinion either sufficient or complete, and I am inclined to believe that probably 50 per cent. of habitual criminals arrested in the provinces escape recognition"; and the Chief Constable of Worcestershire has no doubt that pickpockets and other criminals of a similar class escape identification in considerable numbers.

The Chief Constable of Herts again in answer to the question replies, "Yes, in the majority of instances, but some system is required whereby every habitual criminal should be certainly identified. A 'majority' is not sufficient. The 'minority' may include the worst criminals and those whose apprehension is most wanted and is most desirable."

5. The replies to the fifth question in the circular indicate that difficulty is rarely found in obtaining remands for the purpose of making inquiries into a prisoner's antecedents, The Liverpool Head Constable states that, "in every case where a prisoner brought before the magistrates is suspected of being an old offender, a remand is asked for the purpose of making inquiries."

In the borough of Nottingham "as a general rule all strangers charged with larceny are remanded and routed before being committed."

In Staffordshire remands are always asked for, but the Chief Constable remarks that there are some benches of magistrates "who object to granting remands and failures to identify may arise from this cause."

At Doncaster it is usual to remand for inquiries prisoners who are suspected of being old offenders; but during the race meetings this is not always done and the Chief Constable has no doubt that a good many of the prisoners dealt with in a summary manner are old offenders.

6. In answer to the question put in the sixth paragraph of the circular most of the forces urge that a power to require unconvicted prisoners to be photographed would facilitate their identification.

BIRMINGHAM - - Failure to comply with the provisions of section 8 of the Prevention of Crimes Act should involve an increase of police supervision. The Treasury should pay the expenses of the conveyance of prisoners and of the attendance of witnesses to prove identity. It is probable too that the smallness of the allowance made to witnesses at sessions and assizes deters police officers from giving information about criminals whose photographs they may recognise, in case they may be summoned to give evidence of identity.

BRISTOL - - - The Chief Constable writes, "I may suggest that from experience gained when attached to the Detective Department, Scotland Yard, the police derived most useful and valuable information by their weekly visits to the prisons."

DONCASTER - - District registries should be established at different towns and returns made to them of all convictions of crime in each district; illustrated circulars to be issued monthly or quarterly therefrom with particulars of all registered criminals released from prison.

HERTS - - - "The common sense plan to ensure the identification in all instances of an habitual criminal is that no prisoner should be released from a convict prison on license or on the expiration of his term of imprisonment, without a letter, number, and the year of his discharge tattooed on some special spot on his arm, say, under the upper part of his left arm. . . . Even if a convict rendered this mark illegible by tattooing over it, the fact of his being tattooed in such an unusual place would show that he is an habitual criminal."

MANCHESTER - - The allowance to police officers for attending to prove previous convictions should be increased from 3s. 6d. to 10s. 6d.

NEWCASTLE-ON-TYNE All important forces should issue quarterly circulars giving portraits of criminals supposed to be travelling the country. Chief officers of police should meet now and then in order to promote co-operation in the performance of their duties.

PORTSMOUTH - - Greater uniformity of practice is required; for this purpose instructions for recording personal descriptions, &c. should be issued; lists of discharged convicts and the Illustrated Circular should be supplied to all

forces; the police should also be furnished with information with regard to all persons on the Habitual Criminals Register, when they fail to report, leave the country, die, or are re-convicted; police supervision of license-holders and others should be better enforced; more photographs of travelling criminals should be issued to local forces; the Treasury should pay the cost of detecting, identifying, and prosecuting criminals.

SUSSEX (Eastern Division). The photographs of old offenders to be supplied to every Chief Constable.

WORCESTERSHIRE - A reward of 5s. should be given to prison clerks or warders for information leading to an identification; evidence on affidavit to be made legal proof of a previous conviction in the case of a prisoner not disputing it, and arrangements made to prevent the waste of time involved in police officers' attendance as witnesses to previous convictions. Some restriction should be placed on the movements from one district to another of persons required to report to the police.

APPENDIX A. (2.)

CIRCULAR OF 13TH NOVEMBER 1893.

Identification of Criminals.

Home Office,
13th November 1893.

which a prisoner's identity was thereby traced; and if at the same time you could estimate the proportion of route-forms issued to the total number of prisoners arrested, or give any other definite figures to show the proportion that the number of foreign criminals bears to the number of criminals belonging to your district.

Yours faithfully,
H. B. SIMPSON.

DEAR SIR,
In connexion with the information already requested on the above subject, my Committee would be very glad if you could further give them figures, for any specified period, of the number of route-forms issued by your Force, and the number of instances in

ABSTRACT OF ANSWERS RECEIVED.

BRADFORD :

				No. of Prisoners charged with Felony, &c.	Photographed.	Previously Photographed.	Not Photo- graphed, because well known to the Police.
1893.							
August	-	-	-	33	4	10	19
September	-	-	-	35	12	4	19
October	-	-	-	25	4	2	19
				93	20	16	57

DONCASTER :

In 1892 407 persons were arrested for all classes of offences. Of these 272 were strangers to the borough. Of these 46 were "routed," 28 before conviction, 18 after conviction. Of these 30 were recognised as having been previously convicted. Of the 46 prisoners "routed" 26 were arrested during the race meeting.

MANCHESTER :

During the 12 months ended 31st October 1893, there were 41 route-forms issued with photographs after conviction, resulting in the identification of 22 habitual criminals.

A large number of routes were issued without photographs attached, but with little result.

NEWCASTLE-UPON-TYNE :

During the 12 months ended 31st October 1893, there were 23 prisoners routed, of whom 12 were traced. Of 500 adults proceeded against for serious offences, 395 resided in the city, 80 belonged to the adjoining counties of Northumberland and Durham, and 25 to other parts of the country.

NOTTINGHAM :

During 1892 217 thieves were photographed. Of these 58 were "routed," and of these 43 were identified by the police of other towns.

PORTSMOUTH :

In 1890 the number of route-forms issued in respect of persons arrested for indictable offences was 8, the number of prisoners thereby identified was 5. In 1891 the number of route-forms was 4; no identifications effected. In 1892 3 route-forms were issued and one identification effected.

LEEDS :

From 1st May to 31st October 1893 there were 194 persons arrested for serious offences. Of these 190 were photographed, 114 were known to the police; 80 (including the four not photographed) were total strangers. 223 route forms were issued, and the majority of the strangers were thereby ascertained to have been previously convicted.

LIVERPOOL :

Of the persons convicted of offences involving dishonesty during the 12 months ended 29th September 1893, there were 2,681 who were resident in the neighbourhood, or whose antecedents were fairly well known; 83 who were strangers and suspected of previous dishonesty; 74 were routed, and of these 64 were identified.

The total number of persons arrested for indictable offences during the three years was 338; of these 72 were not resident in the borough.

During the same three years 50 "circulations" were issued from the borough in respect of persons wanted, which resulted in the apprehension of 21 of them.

SCARBOROUGH:

During the five years 1888-92 the number of prisoners arrested for indictable offences was 474; of these 113 were "foreigners"; 70 route-forms were issued, and 34 prisoners were thereby identified.

SOMERSET:

During the year ended 30th September 1893 there were 515 persons arrested for offences involving dishonesty; of these 303 were natives of Somerset, or permanently residing in the county 12 route-forms were issued, and six prisoners thereby identified.

STAFFORDSHIRE:

During three months ended 30th September 1893, there were 416 persons arrested for indictable

offences; of these 62 were unknown at the time of arrest; of these 53 were identified either by route-forms, or by personal inquiry. Of the remaining nine one was committed for trial, and eight were dealt with summarily.

The Chief Constable remarks that in the more thickly populated part of the county personal inquiries generally succeed in procuring information about a prisoner. In the rural parts route-forms have to be more commonly resorted to. A criminal from the north of the county would be more really "foreign" in the south than a Birmingham man would be.

NORTH RIDING OF YORKSHIRE:

During three years ended 30th September 1893, there were 65 route-forms issued, and 43 prisoners thereby identified.

EAST RIDING OF YORKSHIRE:

During 12 months ended 31st October 1893, there were 10 route-forms issued, and two prisoners thereby identified. In each case two route-forms on an average were issued.

APPENDIX B.

Vide p. 18.

NUMBER OF PERSONS CONVICTED during the months of January, February and March 1893, in certain Jurisdictions, showing the Numbers and Proportions per cent. of Prisoners against whom previous Convictions were entered in the Calendars, and the Numbers and Per-centage of those against whom Previous Convictions were proved in Court:—

Jurisdiction.	Number of Persons Convicted.	Number of Persons Convicted.		Per-centage of Persons Convicted.	
		With previous Convictions recorded in Calendar.	Against whom previous Convictions were proved in Court.	With previous Convictions recorded in Calendar.	Against whom previous Convictions were proved in Court.
London :—					
Central Criminal Court (London cases)	224	72	63		
London Sessions (N. and S. of the Thames).	429	236	162		
	653	308	225	47·16	34·40
Lancashire Assizes - - -	114	72	30		
" Quarter Sessions - - -	108	86	63		
Yorks (West Riding) Assizes - - -	41	28	15		
" Quarter Sessions - - -	30	22	18		
Staffordshire Assizes - - -	15	9	1		
" Quarter Sessions - - -	35	26	19		
	343	243	146	70·84	42·56
Liverpool City Sessions - - -	52	79	36		
Birmingham City Sessions - - -	50	37	26		
Warwick (Birmingham Division) Assizes (Birmingham City).	22	12	7		
Bradford Borough Sessions - - -	13	13	10		
	177	141	79	79·66	44·63
Norfolk Assizes - - -	5	4	2		
" Quarter Sessions - - -	12	7	4		
Suffolk Assizes - - -	10	5	2		
" Quarter Sessions - - -	9	6	6		
	36	22	14	61·11	38·88
Dorset Assizes - - -	19	5	4		
" Quarter Sessions - - -	4	3	2		
Devon Assizes - - -	15	3	1		
" Quarter Sessions - - -	7	1	1		
Cornwall Assizes - - -	5	—	—		
" Quarter Sessions - - -	2	1	1		
	51	13	9	25·00	17·30

APPENDIX C.

SPECIMEN ROUTE FORM.

(NOTE.—The MS. portions of this form are here represented by italics.)

LEEDS CITY POLICE.

Route of Prisoner in custody on remand to the 20th day of September 1893, charged with *loitering in the streets with intent to commit a felony.*

DESCRIPTION.

MARKS.

Name, *Alexander Wilson ?*

Alias

Age, *31 years.*Height, *5 ft. 4 ins.*Hair, *dark-brown, mingled with grey.*Eyes, *brown.*Complexion, *fresh.*Build, *prop.*Country, *Irish.*Where born, *Belfast.*Married, or single *widower.*Trade, *moulder.*

Scar near right elbow, scar centre of forehead, lost all single teeth in upper jaw.

[Space for photograph.]

SIR,

I SHALL feel obliged if you will fill in what is known of the prisoner (if anything), and forward the document according to Route, as quickly as possible.

I am, Sir, &c.,

FRED T. WEBB,
Chief Constable.

Leeds, 19th September 1893.

Route.	Date Received.	Result of Inquiry.	Date Forwarded.	Signature.
<i>City Police, London -</i>	<i>20/9/93</i>	<i>Not known - - -</i>	<i>22/9/93</i>	<i>Jas. Mc William, Supt. Pro. R.C.</i>
<i>Metropolitan Police, London-</i>	<i>22/9/93</i>	<i>Not recognised - - -</i>	<i>23/9/93</i>	<i>John Shore, Supt.</i>
<i>Habitual Criminal Registry -</i>	<i>23/9/93</i>	<i>{ Forms R. of Alfred Bull and Henry Bull herewith for comparison. }</i>	<i>23/9/93</i>	<i>J. G. Grace, for Registrar.</i>

Return to Leeds Police by morning of the 25th inst.

APPENDIX D.

BERTILLONAGE IN FOREIGN COUNTRIES.

M. Bertillon first brought his proposals to the notice of the Prefect of Police at Paris in 1879. Towards the end of 1882 the *Service d'Identification Anthropométrique* was established in the capital. In 1883 there were 49 *récidivistes* identified by this special means; in 1884, 241, and the number has since gone on increasing. In 1892 it was 680. In 1885 and 1887 instructions were given by the Minister of the Interior for taking measurements in prisons outside Paris, and since 1888 the measurements there taken have been sent up for record at M. Bertillon's bureau. In any case where it is thought that the prisoner is giving a false name and is an old offender, a note may be made on his card and search will then be instituted at Paris for the previous registration. The original cards are retained at the place where the measurements are taken, and arranged in an alphabetical register. At Lyons and Marseilles, however, there are also anthropometrical registers on the same plan as that in M. Bertillon's office, and it is proposed that similar registers should also be established at Lille, Nancy, Nice, Toulouse and Bordeaux.

In June 1887 a circular from the *procureur général* at Paris impressed on provincial magistrates the desirability of making use of anthropometry for identifying persons charged before them instead of the costly process of photographs and *commissions rogatoires*. It does not appear, however, that so large a number of inquiries as might naturally be expected are in point of fact addressed at present to M. Bertillon's bureau from courts outside Paris. In this respect, no doubt, the system is still far from having attained its full development even in the country of its birth.

Elsewhere in Europe where the Bertillon system has been adopted, it seems to have been adopted mainly with the view of identifying criminals from other countries. In Switzerland it was introduced during the year 1890 in the Canton of Geneva, where there is a large floating population of French and Italians. About five prisoners are measured by the police daily, resistance to the process being made, by a decree of 10th June 1891, tantamount to *rébellion*. The system is thought to have achieved a very signal success; the Canton of Vaud is stated to be going shortly to adopt it, and its ultimate extension to the whole of Switzerland is highly probable.

In Belgium the method is habitually employed in the case of persons suspected of having come from Paris or other parts of France, and important identifications are effected in this way through the co-operation of M. Bertillon's *service anthropométrique*. The use of the system for the ordinary purposes of criminal justice has also been urged on the Government, but in the case of native criminals identification appears to be neither so difficult nor so important a matter as it is in England. On the one hand they are kept far more systematically under the notice of the authorities than would be possible here. Notice of every conviction is sent by the convicting court—even by a *tribunal correctionnel*—to the burgomaster of the commune where the convicted prisoner is domiciled, and this notice follows him at every change of residence. On any fresh charge the information so accumulated is given to the *magistrat instructeur* for use in the *instruction*. Since 1888, moreover, similar notices are also sent by the courts to the Ministry of Justice, and there filed for future reference. When the criminal is a foreigner, he comes under the notice, not of the Ministry of Justice, but of the *administration de la société publique*. Thus a very complete record is kept in duplicate of the convictions of native criminals.

On the other hand the importance of proving previous convictions is much limited by the provisions of the Code, by which a severer penalty is involved only in those cases where a *crime* follows a previous conviction for a *crime*, or a *délit* follows a previous conviction for a *délit* punished by not less than a year's imprisonment. A Bill introduced in the Chamber of Representatives by the Government in 1890 in consequence, as it was stated, of the increase of *la récidive*, proposed to allow the penalties prescribed by the Code Pénal to be increased in every case where an offender is shown to have been previously convicted of an offence

of a similar nature. In many cases the *projet de loi* fixed a *minimum* as well as a *maximum* sentence for the *récidiviste*. These proposals, however, have not passed into law.

In Italy also the Government is considering the question of introducing the Bertillon system, and here again the motive appears largely to be the advantage likely to arise from international co-operation.

In Austria the police at present use the height and the span of the arms as means of identification. Some years ago the question of introducing the Bertillon system was mooted; but the opinion arrived at was that it did not offer sufficient advantages to counter-balance the difficulty and expense of putting it in practice. Only a few experiments, however, were made, and the police do not claim that their opinion on the matter is final.

Experiments in Bertillonage have also been made at the prison at Ploetzensee, Berlin, but the results obtained were not satisfactory, and the system has been abandoned.

In India the system is likely to have a wide extension.

It was introduced in Bengal by Mr. Henry, Inspector-General of Police, in 1892. The measurements used for classification are the length and width of the head, the length of the left middle-finger, the forearm and the left foot, and the height. A print of the left thumb is also taken, but no use is at present made of it for classification.

The instrument used for taking head-measurements has been modified by the addition of a spiral spring, connecting the two arms of the calipers and intended to equalise the pressure, a handle, a self-registering index, and a small appendage to be used when the head-length is taken, for preventing the left arm of the calipers slipping into the eye.

The kind of criminals to be measured has not been definitely prescribed, but instructions have been given to the police for the purpose of ensuring the registration of all professional and habitual criminals, as well as of those whose identity is not known, and who may therefore be specially dangerous. During the first two years that Bertillon measurements were taken over 6,000 cards were accumulated at the Central Bureau.

It is worth noticing that experience in Bengal has already shown that racial differences may necessitate a re-adjustment of the figures fixed by M. Bertillon as the basis of his tripartite division. While the classes based on the length of the head are found, when the measurements of French criminals only are concerned, to contain an approximately equal number of cards, if the limits of the medium class are fixed at 185 and 190 millimetres, in Bengal heads that are more than 185½ millimetres are classed as long, and those only that are less than 181 go into the short class: that is to say, that very nearly all the heads that in Paris are of medium length have to be treated as long in Bengal. Similar differences are found in the case of other measurements. The inferences involved are of considerable interest to the anthropologist; but for the purposes of criminal identification the fact is of importance merely as showing the necessity of caution in adapting Bertillonage to the requirements of another country.

The Bengal police strongly urged that the system they had adopted should be extended to the North-West Provinces and the Punjab, in order to enable them better to deal with the marauders from those parts who are accustomed to make repeated raids into the Presidency.

In view of the success achieved by the system in Bengal, the Government of India are pressing the system on the other local administrations: in the Central Provinces, Assam, and Madras the proposal has been already accepted, and by the last despatches it seems very probable that before long the whole of British India will be following the same method.

It was also introduced into Ceylon during 1892, and Mr. Ellis, the head of the Prisons' Administration, in his report for that year states that so far it had proved eminently satisfactory.

In North America an association was formed early in 1887 among the wardens and superintendents of prisons for securing the registration of criminals, with a view to the improvement of prison administration. The secretary, Major McClaghry, commenced practical experiments in Bertillonage at his own prison at Joliet, Illinois, and the Wardens' Association, at his instance, adopted the system at a meeting held at Toronto in September 1887. A school of instruction was instituted at Joliet Penitentiary. It has been attended by representatives from 10 or 12 important prisons, and some success in the system is said to have been already achieved at the Ohio Penitentiary at Columbus, the House of Correction at Detroit, the Western Penitentiary of Pennsylvania, the New Jersey State Prison at Wrenton, and elsewhere.

In the Central Prison at Toronto Bertillonage was established in 1889 for all criminals, as distinguished from tramps and drunkards; but from the Wardens' report for that year, it seems that there is no central office for keeping the records and photographs; and, from the absence of any mention of the system in subsequent reports, it may be inferred that it has not yet been carried beyond a purely experimental stage.

Lastly, careful attention has been given in the United States to the question of making use of Bertillonage as a preventive of fraudulent enlistment in the

United States Army, but the system was not considered suitable for this purpose. One of the main obstacles to its adoption was that hitherto it has been applied exclusively to the criminal classes, and it was deemed objectionable to subject recruits to a process which might be supposed to carry with it dishonourable and degrading associations. The method instituted in its stead for classifying the personal descriptions of newly enlisted soldiers is based partly on the height and the colour of the eyes—two colours only, namely, brown and blue or grey, being now recognised,—and partly on a careful record of bodily marks. Some account of it is given in a pamphlet by Lieut.-Colonel Greenleaf and Major Smart, of the United States Army, read at London in August 1891 before the Seventh International Congress of Hygiene and Demography, and published in the *Transactions*, vol. viii. p. 294.

H. B. S.

[NOTE.—The above account of the growth of Bertillonage is founded, as regards France, on M. Bertillon's published writings; as regards other European countries, on information obtained through the Foreign Office; as regards India, on official despatches communicated by the India Office; and as regards America, on the introduction to the English translation of M. Bertillon's *Instructions*, issued from Joliet Penitentiary for use in America.]

APPENDIX E.

1. INSTRUCTIONS FOR TAKING THE MEASUREMENTS OF PRISONERS.

The following instructions have been adapted, with the kind assistance of Mr. E. R. Spearman, from those given by M. Bertillon in his "Instructions Signalétiques," Ed. 1893. Their object is to secure an exact uniformity in the mode of taking the measurements. If used for the guidance of learners, they must be accompanied by diagrams, and in most cases personal instruction will be required.

I.—Length of Head.

This measurement is taken from the root of the nose to the point at the back of the head, which is furthest distant from it.

This and the following measurement are taken with a callipers or compass specially constructed for the purpose with legs that are arched below and move above on a graduated scale.

1. Let the prisoner sit on a stool, with his face turned towards the light and slightly inclined downwards. Stand at his left side and with your left hand hold the point of the left leg of the compass in the hollow at the root of his nose. The end should be held between the finger and thumb, and to keep it from slipping, they should project a little beyond it, and rest on the nose. Meanwhile hold the other leg of the compass with your right hand between your finger and thumb, about half an inch from the end, and let the other fingers of both hands support the compass in such a way that the scale between the two legs may catch the light and be easily read.

2. You have now by means of the scale to find the point at the back of the prisoner's head which is furthest from the root of his nose. To do this, hold the point of the left leg of the compass steady, while you move the other point slowly from the top of the head downwards, keeping it as nearly as you can in the middle. Keep your eyes fixed on the scale, and note the highest figure shown by the index. This figure represents the maximum length of the head. To make sure you have got it correctly, pass the end of the compass once or twice up and down near the spot. Then take the compass away, and fix it by means of the screw at the figure you have noted. To do this easily, you should let the fingers of the left hand support the compass underneath, with the thumb across the left leg above. Your right hand is thus left free to bring the right leg of the compass to the proper point on the scale, and to turn the screw.

3. Now test the accuracy of your measurement with the compass fixed; holding the left end as before, and moving the other end to and fro and up and down at the back of the prisoner's head. If there is any part of the head over which the end of the compass will not easily pass, or if, on the other hand, the end passes over the head without touching it anywhere or scarcely touching it, the compass must be re-adjusted. When it is set rightly, you will find that it will pass without pressure over any part of the back of the head, and that at one point—that from which the measurement is taken—it will perceptibly touch the skin of the head.

4. To ensure accuracy it is essential that the measurement first taken should be verified, as indicated above, with the compass fixed, and in some cases it may be necessary to repeat the operation more than once. The true measurement is found when the compass touches at one point only, and passes over that point without pressure. If it touches nowhere, it is too long; if there is a point where it needs pressure to make it pass, it is too short.

5. Care must be taken against error being caused by the prisoner frowning or twitching his eyebrows.

II.—Breadth of Head.

This measurement is taken between the two points on the two sides of the head which are furthest apart on the same level and exactly opposite one another.

1. Let the prisoner sit on a stool in the same position as before, and stand exactly behind him, your heels together and your body straight so that your elbows may move freely and evenly.

2. Take one leg of the compass in each hand near the end and put the ends just above the place where the ear joins the head. Then move them slowly upwards, taking great care that they move quite evenly, that is to say, on the same level and exactly opposite one another. If now you fix your eyes on the scale

you will find that in most instances the figure shown by the index increases for a time and then, as you get nearer the top of the head, begins to diminish. When by moving the compass up and down again, you reach the level at which the figure is highest, you must move the ends of the compass slowly to and from you, making sure that they still keep exactly even. In this way you will find the greatest breadth of the head. This is usually, though by no means invariably, a little above and behind the ears.

3. Then, in the same way as before, fix the compass with the screw at the point you have noted and test the accuracy of your measurement. To do this properly you must move the compass evenly up and down, beginning behind the ear and at each up and down movement pushing the compass rather further from you, so that each of its points describes a course like this.  If they describe a course like this you are very likely to miss the place where the head is broadest.

Note that the movement of the compass in checking the width is not the same as in ascertaining it. To ascertain the width the compass is first moved up, and then at the widest point is moved backwards and forwards. To check the width the compass is moved forward, describing as it moves a series of close zig-zag lines, about an inch long.

4. It is of great importance that all the time the measurement is being taken the prisoner should sit evenly and that you should stand quite straight and square. Otherwise you will be apt not to move the points of the compass exactly together and your measurement will consequently be wrong.

If the compass is tilted up at one side, so that one leg is on a higher level than the other, or if it is twisted round, so that one leg is further forward than the other, the measurement will be wrong. These are the two errors specially to be guarded against. The points of the compass must be kept on the same level and exactly opposite one another.

In verifying your measurement, as in taking the length of the head, both points of the compass must perceptibly touch the skin at the spot where the head is broadest, but must be able to pass over that spot easily and without pressure.

NOTE.—In the case of both the above measurements you should specially note a head that is very irregularly shaped or not symmetrical.

If a wound or other injury prevents the measurement being taken or affects its accuracy, a note must be made of this.

III.—Left Middle Finger.

This and the two following measurements are taken with a graduated sliding rule. This rule has two fixed arms projecting on opposite sides about 4 inches and about 1 inch, and a slide consisting of two arms which also project about 4 inches and 1 inch respectively.

The middle finger is measured with the smaller arms. The finger while being measured must be held at right angles to the back of the hand, and the measurement is taken from the finger-tip to the knuckle.

1. Stand facing the prisoner, holding the sliding rule with your right hand and resting the longer arms of the rule obliquely against your chest. Take the prisoner's left middle finger with your left hand and place it along the rule with the tip against the small fixed arm. The other fingers should not be bent like the middle finger, but should pass freely on each side of the rule.

2. With your left thumb on the third joint (i.e., the joint next the finger tip) press the prisoner's finger against the rule so as to keep it straight, and with three fingers press gently on the back of his wrist so as to keep the middle finger at right angles with the back of his hand, and its point against the small arm of the rule. Your little finger meantime presses against the under side of the prisoner's wrist.

3. Now turn half-way round so as to have your left side towards the prisoner, raising your elbow as you do so. Do not allow the prisoner to move, but carry his left hand round with you, bringing the arm forward and bending it at the wrist. This is the best position in which to get the finger to be measured perfectly straight.

4. Standing in this position, see that the tip of the finger touches the fixed arm of the rule, and that the finger is at right angles to the back of the hand and lies close to the rule all its length and particularly at the knuckle. If necessary raise or lower the rule or turn it round a little. It is absolutely essential to have the finger in the right position on the rule. When this is secured, push up the slide with your right hand till it touches the knuckle lightly and read off the measurement.

NOTES.

The *nail*, if projecting beyond the finger tip, should be cut before measuring. If this cannot be done, an estimated correction of one or two millimetres may have to be made in the measurement.

Stiff Joints—If there is a stiff joint which entirely prevents the finger being placed in the proper position for measurement, mark "stiff joint" on the card (specifying which joint), and take the measurement of the *right* middle finger. If there is merely a slight stiffness in the joints which prevents the fingers lying quite straight on the rule (this is common in blacksmiths, navies, &c., and usually affects both hands), measure the length as well as you can, and in noting the measurement mark the case as one of "stiff joint," and add a figure (+2, +3, or +4), which represents, as nearly as you can estimate it, the addition necessary to show the true length of the finger. This will indicate in the Registry the limits within which a double search may have to be made.

Amputation.—If the finger is amputated, note this on the card, giving the measurement of the part left if any, and measure the corresponding finger on the right hand.

IV.—Left Forearm.

The left forearm is measured from the extremity of the elbow bent at a sharp angle to the tip of the middle finger. In taking the measurement, the arm is laid on a specially constructed table about $3\frac{1}{2}$ feet high, and the length is then taken with the longer arms of the sliding rule.

1. Direct the prisoner to stand with his left side to the table and to lay his left arm flat—the palm of the hand downwards—on the place marked for that purpose. Standing on the opposite side of the table, adjust his arm so as to make it lie perfectly straight and parallel with the edge of the table, the elbow and the forefinger close to the edge, and the thumb projecting over the edge. Be careful to see that the middle finger, the middle of the wrist and the extremity of the elbow lie in a line.

2. Put your left hand on prisoner's wrist to prevent its moving, and then tell him to advance his shoulder by leaning forward till the upper arm comes so far forward as to make a sharp angle, *about half a right angle*, at the elbow. If necessary, direct his movements with your right hand.

This movement usually disturbs the position of the arm. If so, adjust it again, and see particularly that the part next the elbow lies on the table.

3. Now bring forward the sliding rule (which should have been previously placed on the table) keeping it parallel to the edge, and place it with the fixed arm touching the extremity of the elbow. Then with the left hand push the slide till it touches the tip of the finger.

4. The rule now gives the length of the forearm if there is no trickery on the prisoner's part—but before reading the measurement, in order to make sure that the prisoner is not altering the measurement by slightly arching his hand or fingers, press the back of

his hand and middle finger and his wrist firmly on the table with your right hand; but while so doing use your left hand to keep the rule in position and with its fixed arm touching the elbow. If there has been any attempt at trickery, the pressure of your hand will flatten out the prisoner's hand and finger and move the slide slightly. Now read off the measurement.

5. If you still suspect that the prisoner by contracting his hand has slightly altered the measurement, raise his hand from the table, bend his wrist firmly, then bring the hand down flat sharply and take the measurement instantaneously. The alteration which a prisoner can make is very slight, and the attempt is easily detected; but if any such attempt is suspected, this should be indicated on the card by writing after the measurement the letters *TR* ("trickery").

Stiff joints, the loss of a finger, &c., are dealt with in the same manner as in the case of the middle finger. If any signs of a fracture in the forearm is noticed, the card should be marked "*fracture*" and the measurement of the right arm added.

V.—Left Foot.

The measurement of the foot is taken from the point of the longest toe to the heel. It is taken with the longer arms of the sliding rule.

1. Place the stool in front of the table at a distance of about 2 feet. Make the prisoner stand on the stool on his left foot, leaning forward and resting his right hand on the handle of the table provided for this purpose.

2. See that the foot rests flat on the stool, and particularly that the weight is not thrown on the inside edge of the great toe and that the toe is not bent.

3. In taking this measurement attention must be given to the possibility of the prisoner's reducing the measurement by bending the great toe and slightly arching the foot. This trick is easy to detect and the position of standing on one foot with the toe bent is difficult to maintain for more than a minute; the attempt can generally be checked by making the prisoner bend his knee slightly so as to throw forward his weight and spread out the toes.

4. When the body, foot and great toe are in position, lay the sliding rule on the stool along the inner side of the foot, touching the inside of the heel and the joint of the great toe, and with the fixed arm pressing gently on the back of the heel. In cases where the middle part of the foot projects so as to prevent the rule touching both the inside of the heel and the joint of the great toe, place it as nearly as possible parallel to the usual position.

5. Move the slide till it touches the great toe; then, if you still suspect any bending of the great toe, press down the joints with your thumb (taking care, however, not to press on the nail), and allow the slide to move back. See that the position of the rule and fixed arm has not been disturbed, and read off the measurement.

NOTES.

If the great toe is *turned inwards* towards the other toes, this should be noted after the measurement and a figure added to show the estimated diminution of the length of foot from this cause.

If the great toe is *drawn in* by a permanent contraction of the tendons, usually caused by wearing too short boots, this should be noted in the same way.

If the second toe is longer than the great toe, the measurement should be taken to the tip of the second toe and should be marked on the card with the sign > followed by a figure representing the estimated length of the second toe beyond the great toe.

If the left foot is amputated, note this and measure the right foot.

If the toes or part of the foot is amputated, measure what remains and, after this measurement, add also the measurement of the right foot. If the wound is still fresh, no measurement of the left foot should be taken.

2. INSTRUCTIONS FOR TAKING DISTINCTIVE MARKS.

The following instructions merely give the main points to be followed in taking the description and measured position of the bodily marks that can be used for identification. For use by wurgers, they should be amplified and illustrated by diagrams, and there should be a complete table of the abbreviations to be used.

1. Make the prisoner stand facing you, his arms straight down by his side, the *palms of the hand turned forward*. All marks on the limbs should be described with reference to this position, although you will have to lift and turn round the arms and hands, in order to find and measure the marks.

When therefore you speak of the *front* of the arm, you include the palm of the hand and all the side of the arm turned forwards in the position just described; similarly the *back* of the arm includes the back of the hand and the point of the elbow. The *inner side* is the side of the arm, which in the position given is turned *towards* the body;* the *outer side* is the side turned away from the body.

So the "inner side" of the hand and of each finger is that towards the little finger; the "outer side," that towards the thumb.

2. In describing the marks, state first the *nature* of each mark, then its *shape*, its *size*, its *direction*, and finally its *position*.

3. For measuring sizes and distances a small millimetre rule is used. The measurements are given in millimetres, but they do not require to be taken with the same accuracy as the measurement of the head, &c. Above 50, round numbers (60, 70, &c.) suffice.

Nature of Mark.

4. Say whether the mark is a scar ("sc"), tattoo ("tat"), birth-mark, &c.

5. In dealing with scars it is important only to give those that are permanent. If there is any doubt, note them thus (*not permanent*), or (*recent*). State, if possible, whether the scar arises from a cut, a burn, an ulcer, &c.

6. In dealing with tattoo marks state the object represented "anchor," "heart," &c. If the tattoo mark consists of words or letters, copy them carefully.

Special care should be taken to detect and note any case where a tattoo mark has been removed or altered. The attempt to remove a mark can generally be detected, and the partially obliterated mark can often be deciphered.

Shape of Mark.

7. The shape of scars should be noted. Where the scar is a straight line, e.g., where it is made by a sharp cut, it may be described as *rectilinear* ("RECT."). A scar may also be in a "curved line," "waved line," broken line, V. shape, Z. shape, X. shape, cross (+), &c.

Scars that are not linear, may be described as *oval*, *oblong*, *circular*, *triangular*, &c.

The shape of birth-marks should be given in the same way, and the colour should be stated. The shape of a tattoo mark is usually given in stating the object represented (paragraph 6).

Size.

8. When a scar or other mark is a line, give the length in millimetres. If it is circular, give the diameter. If oval or oblong, give both length and breadth. Give length and breadth of tattoo-marks.

Direction.

9. The direction of lines is to be given as vertical (VERT), horizontal (HOR) or slanting (SL). A line is vertical if, while the prisoner stands in the position already described, it runs up and down or nearly so—horizontal if it runs across on the same level or nearly so—slanting if it slopes from one side to another.

10. In the case of slanting marks you must give the direction the slope takes *downwards*, i.e., say whether it slopes "inwards" (towards the body, or the middle line of the body), "outwards," "forwards" or "backwards."

11. In describing curved scars, say in which direction the *hollow* of the curve turns—hollow side *up* or *down*, to *front*, to *back*, &c.

Position.

12. The marks are taken in the following order:—

- I. Left arm and hand.
- II. Right arm and hand.
- III. Face and throat.
- IV. Chest (down to navel).
- V. Back (including back of neck).
- VI. The rest of the body.

13. In taking the marks work generally from left to right and from above downwards.

I. and II.—Arms and Hands.

14. In the upper arm, say whether the mark is on the front, back, inner side or outer side, and give the distance from elbow or shoulder.

Example:—

Scar rect., 25 m. long, vert.; 50 m. above elbow, back of right upper arm.

15. In the forearm, state in the same way whether the mark is on the front or back, inner side or outer side, and give the distance from the elbow or wrist.

16. On the hand indicate the position of the mark on back or front (e.g. "at base of thumb," "between" "forefinger and middle finger, &c.").

17. Each finger has three joints, and the sections of the finger between the joints are called phalanges. You can, therefore, besides saying that a mark is on front, back, &c. of a finger, give its position on first joint, second joint, third joint—or on first phal., second phal., third phal. The numbers begin from the joint next the back of the hand, the joint nearest the finger tip being the third joint.

Similarly with the thumb except that there are only two joints and two phalanges.

III.—Face and throat.

18. The chief points in the face and throat used for indicating positions and distances of marks are:—

The line of the hair.

The root of the nose.

The eyebrows (inner end, outer end, middle).

The eyes (inner angle, outer angle).

The point of the nose and the outer corners of the nostrils (right and left).

The ear (highest point and lowest point).

The corners of the mouth.

The larynx or "Adam's apple."

The cheek, chin, temple, &c., are used to assist in describing the position of marks, but the distances from points should always be given.

Examples:—

Scar rect., 20 m. long, hor.; 25 m. below outer angle of right eye.

Birth-mark, circ. 3 m. diam. on left cheek 30 m. in front of lowest part of ear.

IV.—Chest.

19. The measurements are taken from:

The fork of the breast-bone,

The nipples (right and left),

The navel,

The "middle line."

The latter is an imaginary line dividing the body down the middle (i.e., passing through the centre of nose and chin, the larynx, and the navel).

Example:—

Scar, oval, 2 by 5; 60 below larynx, 35 to left of middle line.

Tattoo mark, anchor, 5 by 6; 40 above navel, 25 to right of middle line.

V.—Back.

20. The measurements are taken from the "middle line," which here follows the centre of the backbone, and the seventh vertebra. The seventh vertebra is the most prominent section of the backbone, and lies a little above the line of the shoulders. Its position is sometimes not easy to determine with exactness, and some allowances must be made for errors. When the prisoner is stout, the point becomes more prominent if he is made to bend forward his head.

Example:—

Scar, curve, hollow upwards, 50 long; 150 below seventh vertebra, 80 to right of middle line.

VI.—

21. Only very prominent marks, e.g., loss of limb or toe, &c., are to be given.

22. If there are several clearly distinctive marks on I., II., and III., no marks need be noted on IV., V., and VI., except such as are specially prominent or characteristic.

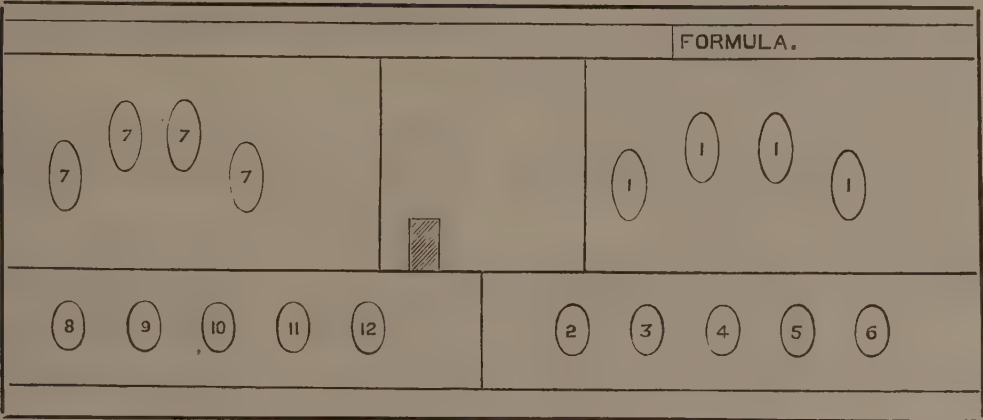
(The descriptions are much shortened by the use of abbreviations similar to those employed by M. Bertillon, and recommended in the report, page 19. Only a few examples of these abbreviations are given above. The m. for millimetre may always be omitted, as all the measurements are in millimetres.)

* Note especially that the *inner* side of the arm does not include the inside of the *elbow* which in the position given forms part of the *front* of the arm.

APPENDIX F.

INSTRUCTIONS FOR TAKING FINGER-PRINTS.

Every prison where finger-prints are to be taken will be supplied with a plate of copper, 10½ ins. by 7 or of such other size as experience may show to be most convenient, screwed by its corners and down both ends to a board 1 inch thick, an ordinary printer's roller, 9 inches in length and 3 in diameter, two tubes of ordinary printer's ink, some benzole and a stock of cards 12 inches by 5 as indicated in the report.



1. Squeeze less than a drop of ink on the copper plate and work it with the roller till it forms an even layer over the surface. The layer of ink must be so thin as to allow the copper colour of the plate to show through it.
2. Take the prisoner's right hand and lay the bulbs of the four fingers flat on the inked plate pressing them gently but firmly with your own hand. Then lay the inked fingers flat on the upper right hand division of the card pressing them as before with your own hand, so that imprints of the four finger bulbs may be taken at the places marked 1 in the above woodcut.
3. Then take the thumb of the right hand, roll the bulb slightly on the inked slab and roll it again on the lower part of the card at the part marked 2. Do the same with each of the fingers in succession, so that imprints of them may be taken at 3, 4, 5 and 6. These

- imprints will be more extended than those taken at 1, but are sometimes not so sharp.
4. Repeat the process with the prisoner's left hand, except that it will probably be found more convenient in taking the *separate* imprints of the fingers to begin with the little finger at 8. In any case, however, the left hand thumb must be printed on the card at 12.
 5. Care should be taken in the lower range of imprints that the whole of the finger bulbs should be laid on the card well above the line that cuts off a margin at the bottom.
 6. Both the roller and the slab must be thoroughly cleaned with benzole, dried with a rag, and put out of the way of dust when done with.
 7. The fingers may also be readily cleaned with benzole or turpentine after the imprints have been taken.

APPENDIX G.

MEMORANDUM AS TO THE READING OF FINGER PRINT FORMULÆ.

(Revised by Mr. Galton.)

The following memorandum is intended as the basis of the instructions for the assistants in the Central Registry who have to deal with finger prints. It is not to be regarded as final, but merely as a brief statement of Mr. Galton's method in its present stage. Alterations in details will be made as the process is developed in practice.

Symbols.

The following are the leading symbols:—

- l* denotes a loop in any digit except the forefinger.
- r* and *u* denote a loop in the forefinger, *r* if it comes from the radial or thumb side, *u* if it comes from the ulnar or little finger side.
- a* denotes an arch.
- w* denotes a whorl, which includes every pattern in which any one ridge makes a complete circuit.
- x* denotes a pattern that is undecipherable, through injury to the finger or otherwise.
- z* is used when a finger is wanting.

The following are subordinate symbols:—

- r* and *u* affixed to *w* (*w_r* or *w_u*) denote that the whorl is enclosed in a loop coming from the radial or ulnar side respectively; *r* should also be added to those occasional cases of *l* (not occurring in the forefinger) to which it applies.
- v* affixed to *l*, *r*, or *u*, denotes an "invaded loop," i.e., when the core enters the loop from one side.
- y* affixed to *l*, *r*, *u*, or *w*, denotes a pattern that suggests an eyelet hole; it is often transitional between a loop and a whorl.
- k* affixed to *l*, *r*, or *u*, denotes a form of loop in which the core is distinctly hooked.

Reading Patterns.

The assistant must acquire knowledge of the types of pattern mentioned above by examination of a large number of actual finger prints. He should fix his attention first on the outline of the pattern, and then on its core, and never allow it to dwell on non-essentials however conspicuous they may be, such as differences due to the impressions having been taken from slightly different parts of the finger, or being blacker in some parts than others. He should also practice tracing patterns in the manner described in "Finger Prints," page 69. He will be supplied with a book containing photographic reproductions of the forms of pattern which are transitional between the types mentioned above, showing in each case to which type the form is to be assigned. When a knowledge of these forms is acquired in this way, few cases will occur which cannot be assigned with certainty to one or other of the main types.

In reading off imprints, first determine to which type the pattern belongs and write down the symbol *a*, *l*, *r*, *u*, or *w*, as the case may be.

In the case of a transitional form, note below the line the other possible interpretation, e.g., *l_r*, *w_u*. These symbols should be added even in cases where there is no doubt as to the type to which the print belongs, but where they may aid the searches in the register by indicating a well-marked feature.

Writing Formulæ.

In writing the formula for the set of 10 finger prints the symbols will be written in the following order: the first, second, and third finger of right hand; the first, second, and third finger of left hand; the thumb and little finger of right hand; the thumb and little finger of left hand. They will thus fall into four groups, divided as in the following example, *ull, alw; ul, ul*.

The formula will be noted at the right hand top corner of the card.

Arrangement of Cards.

The drawer in which each card is placed is determined by the measurements on the Bertillon method.

The cards in each drawer will be arranged in the alphabetical order of the finger-print formulæ.

Search.

When a search card giving the finger prints and measurements of an unidentified prisoner is received, the formula will be written down in the same way. Special care must be taken in this case to note transitional forms of pattern.

The drawer in which the original card will be found is determined by means of the measurements in accordance with the Bertillon method. When this is done, the card or cards in the drawer having the same formula as the search card should be taken out.

If several cards are found having that formula, seek some distinctive feature, either already noted in the formula, (e.g., *w_r*), or in the patterns themselves, and look through the cards bearing that formula to see whether any of them has this feature.

When one card has been selected, compare carefully the prints of several of the fingers with those on the search card, to ascertain whether they are imprints of the same hands.

A minute comparison of the details in the prints requires the use of a lens (a watchmaker's lens is convenient); also of two or more pairs of "pointers" to mark down corresponding points in the two imprints. From which, as from starting points, others may be successively laid down. A pointer consists of a wooden arm a little thicker than a pencil, from 6 to 10 inches long, having a common pin inserted firmly into its pointed end and then bent downwards. The arm is fixed to a short cross-bar (3 or 4 inches long), which rests on two nails with smooth heads. Thus the pointer is a tripod. The arms of the two pointers in each pair should be of different lengths to prevent their cross-bars from interference when they are both in use on the same print.

If the card is not found under the same formula, and if there are any transitional forms in the prints on the search card, search should be made under the other formula or formulæ indicated by transitional symbols.

If the card is not found there, it is not in the drawer.

Subdivision.

When the cards in one drawer bearing the same formula become very numerous, a subdivision will be necessary.

This will occur first with the formula *ull, ull; U, U*.

The principle of subdivision is to select one finger—the same in all cases (say the right forefinger), and having with the aid of the pointers determined (1) the central ridge of the loop, (2) the corner where the ridges, passing over the loop, diverge from those passing below it, to count the number of intervening ridges. The cards having this formula are then arranged according to number of ridges.

When there is no central ridge, but a narrow loop or "staple," the counting is to begin from the further shoulder of the staple.

In searching, count the ridges in the same finger in the same way, and search those of the cards of the *ull, ull; U, U* formula having the same number of ridges. Allowance must be made for a possible error of two in counting the ridges. Thus, if the number counted is 7, it is necessary first to look through the cards having 7, then those having 6 and 8, then those having 5 and 9.

Fig. I. CARD.

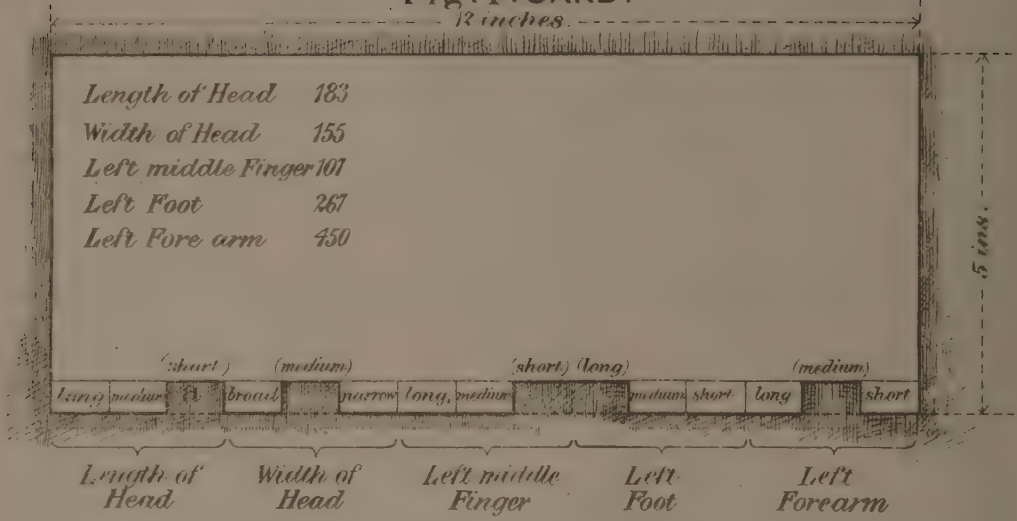


Fig 2. PLAN OF DRAWER.

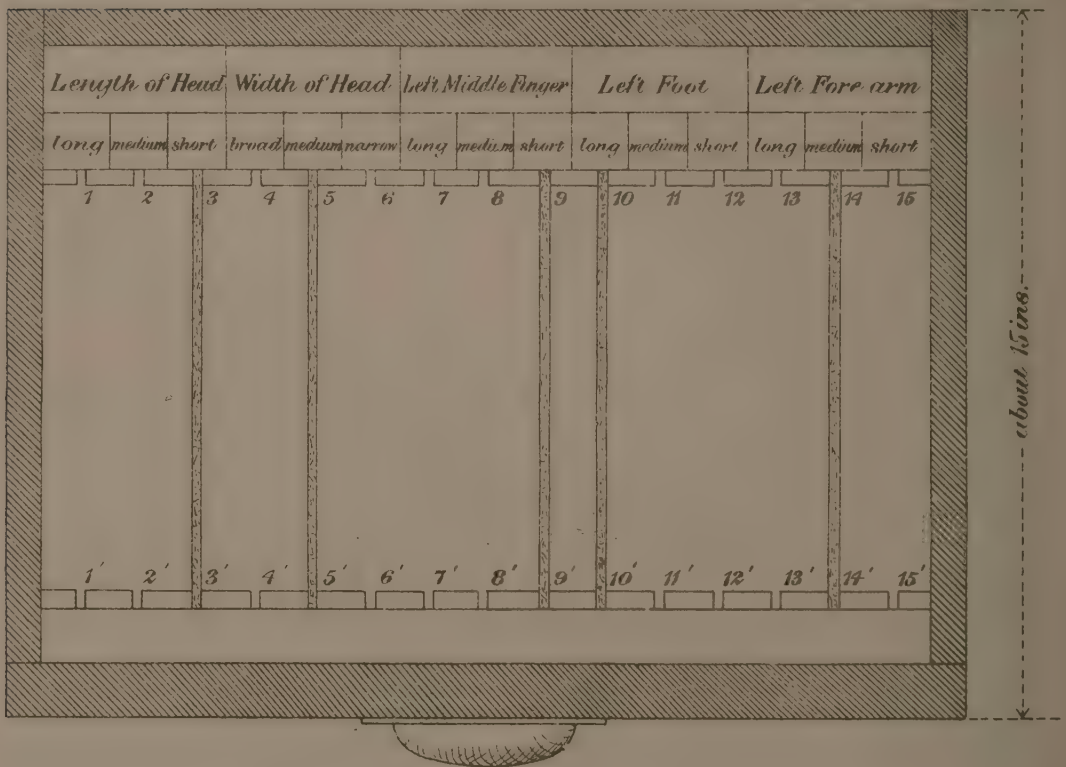
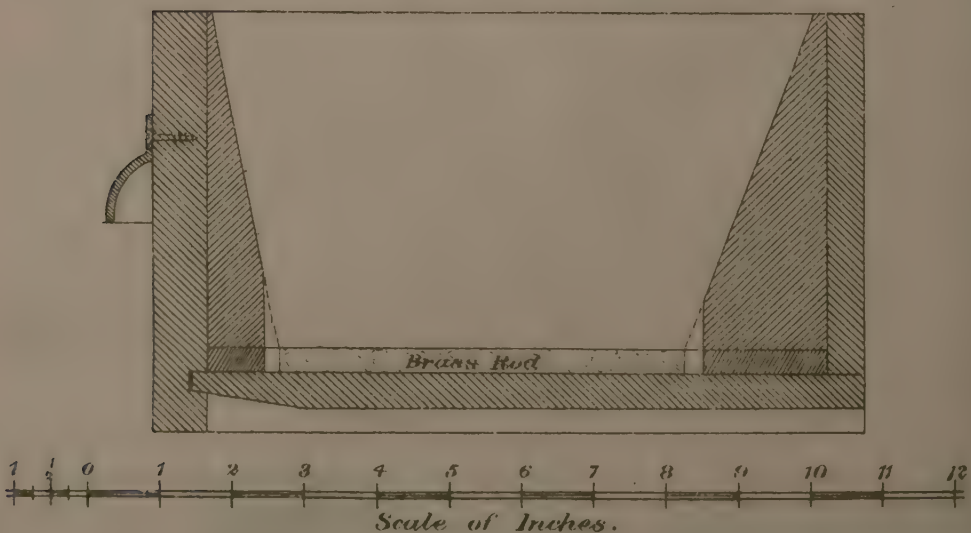


Fig 3. SECTION OF DRAWER.



APPENDIX H.

MECHANICAL CONTRIVANCE TO CHECK THE SORTING OF THE CARDS IN THE BERTILLON CABINET.

The accompanying diagrams explain the mechanical arrangement devised by Mr. Galton to secure that each card in the Bertillon cabinet should be placed in the proper drawer. Fig. 1 represents one of the cards described on page 32 of the report with the measurements noted on the left-hand corner, the other particulars having been omitted as not essential for the present purpose. Fig. 2 is a plan of one of the drawers in the Bertillon cabinet; and Fig. 3 a section of the drawer from front to back.*

Each drawer is made $12\frac{1}{4}$ inches broad by 5 inches deep, so that the the cards, which measure 12 inches by 5, placed edgewise, may fit in with $\frac{1}{4}$ inch play to either side from their mean position. The length from front to back of the drawer will be sufficient to allow about 500 cards standing edgewise to be placed in it. At the lower edge of each card 15 equal spaces (arranged in groups of three) are marked off, and any one or more of these spaces can be notched out. At the front and back of the drawer, in which the cards are to stand, there are 15 grooves, between which narrow rods of brass or wood can be placed edge upwards. Suppose now we have the card of a prisoner whose head length is 183. This ranks as a Short Head, consequently a

notch is cut in the card at the third space (α in Fig. 1). In each of the drawers in the section of the cabinet for Short Heads a rod is placed at the bottom of the drawer between the third groove (3 and 3' in Fig. 2). If the card in question is placed in any one of the drawers for Short Heads, the notch will stride over the rod, and the card will therefore fit the drawer; but if the card is placed in a drawer for Long Heads (in which the rod extends from 1 to 1'), or for Medium Length Heads (where the rod extends from 2 to 2'), there will be no notch to admit the rod, and the card will be tilted up so that its upper edge is not level with those of the other cards, and will prevent the drawer shutting. Similarly with the other five measurements. Each drawer will thus have five rods running from back to front along the bottom, and each card will have five notches cut in the lower edge; and assuming the notches to be properly cut, each card will fit into its proper drawer, but will not fit into any of the 242 other drawers in the cabinet.*

* The width of the notches so much exceeds the width of the rods that the lateral play of the cards in their box does not at all interfere with the action of the apparatus. Each notch is 8 tenths of an inch in width, the lateral play is $2\frac{1}{2}$ tenths, which reduces the available width of the notch to $5\frac{1}{2}$ tenths. Consequently the rod might theoretically be a full half-inch in width, but it would be proper that to allow for defects in straightness it should not exceed a quarter of an inch.

* The diagrams have been drawn for the Committee by Mr. F. W. Troup, Architect.

IMMIGRATION INTO THE UNITED STATES.

RETURN to an Order of the Honourable The House of Commons,
dated 2 March 1893;—for,

COPY “of COMMUNICATION addressed to Mr. *John Burnett* and Mr. *David Schloss*, directing them to inquire into and report on matters connected with the IMMIGRATION of FOREIGNERS into the *United States*.”

Gentlemen,

Board of Trade, Whitehall-gardens,
24 February 1893.

I AM directed by the Board of Trade to inform you that you have been appointed to inquire into the laws relating to the immigration of foreigners into the United States, the practical methods of enforcing those laws, the state of opinion in the United States with reference to restrictions on immigration, the proposals on the subject before Congress, and the nature and economic effect of the immigration of destitute foreigners from the Eastern parts of Europe. For this purpose you will forthwith proceed to the United States and make such inquiries as can be made in a time which will admit of your report or reports being laid before Parliament early in July next.

It will probably be convenient, owing to the limited time at your disposal, that the subjects for inquiry should be divided, and I am to suggest, as the most convenient arrangement, that Mr. Schloss should inquire more particularly into the United States laws and their administration, and Mr. Burnett into the nature and economic effects of that portion of the immigration which is of the character of the recent immigration of destitute foreigners from the Eastern parts of Europe into England.

To Messrs. John Burnett
and David Schloss.

I am, &c.
(signed) *Courtenay Boyle*.

IMMIGRATION INTO THE
UNITED STATES.

COPY of COMMUNICATION addressed to Mr. John
Burnett and Mr. *David Schloss*, directing them to
inquire into and report on matters connected with
the IMMIGRATION of FOREIGNERS into the *United*
States.

(*Mr. Mundella.*)

Ordered, by The House of Commons, to be Printed,
2 March 1893.

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[*Price ½ d.*]

LICENSES (WOODS AND FORESTS DEPARTMENT).

RETURN to an Order of the Honourable The House of Commons,
dated 16 March 1893 ;—for,

RETURN “ showing the Number of LICENSED HOUSES Leased by the Department of
WOODS and FORESTS during the Ten Years ending the 31st day of March 1892 ;
the Terms on which the Leases have been Granted ; and, in cases of Renewals, the
Terms on which the Premises were previously Held :—

Date of Leases.	Premises Demised.	Terms Granted.	New Leases.			Preceding Leases.		Observations.
			Rents.	Fines (if any).	Other Considerations if any for Leases.	Rents Reserved.	Fines (if any).	

Treasury Chambers,
30 March 1893. }

JOHN T. HIBBERT.

(Mr. Loder.)

Ordered, by The House of Commons, to be Printed,
30 March 1893.

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90, WEST NILE STREET, GLASGOW ; or
HODGES, FIGGIS, & Co., 104, GRAFTON STREET, DUBLIN.

RETURN RELATING TO LICENSES

RETURN of LICENSED HOUSES Leased by the COMMISSIONERS of WOODS and FORESTS, during the 10 years ending 31st March 1892.

Date of Lease.	PREMISES DEMISED.	Terms Granted.	New Leases.			Preceding Leases.		OBSERVATIONS.
			Rents.	Fines (if any).	Other considerations (if any) for Leases.	Rents Reserved.	Fines (if any).	
26 Nov. 1886 -	ESSEX. HAINAULT ESTATE. A farm and lands known as Ley-street Farm, with the farmhouse and buildings thereon, and the Cauliflower Inn and garden thereto, containing altogether about 83A. 2R. 27P., situate in the parish of Barking.	14 years, from 10th October 1885.	£. s. d. 188 - -	£. s. d. - - -	- - - - -	£. s. d. - - -	£. s. d. - - -	The premises with 7A. 21P. additional land, were last let at an unapportioned rent of 229 l. 6 s.
2 Nov. 1887 -	GLOUCESTER (DEAN FOREST). Messuage, called the Speech House, with the garden and outbuildings, and three pieces of land containing altogether 15A. 1R. 9P.	14 years, from 25th September 1887.	200 - -	- - -	- - - - -	55 - -	- - -	The increased rent represents the interest on the Crown's outlay on additional buildings and improvements.
22 May 1889 -	KENT. ELTHAM ESTATE. A piece of land on the south side of High-street, Eltham, with the messuage, beerhouse, and buildings thereon, known as the "Man of Kent."	95½ years, from 5th April 1889.	15 - -	- - -	The expense incurred in the erection of the buildings.	- - -	- - -	Erected on part of a piece of land containing 2A. 16P., which, with a public-house and two other messuages formerly standing thereon, was last held on a yearly tenancy at an unapportioned rent of 60 l. 10 s. per annum.
26 Sept. 1883 -	MIDDLESEX. The "Golden Lion" public-house, No. 104, Wardour-street.	21 years, from 5th April 1883.	60 - -	280 - -	The expenditure incurred by the lessees on the premises.	- - -	- - -	Previously leased with several other messuages and premises at an unapportioned rent of 396 l., and upon payment of a fine of 3,378 l.
15 Dec. 1883 -	The Holborn Restaurant, High Holborn - - -	79½ years from 10th October 1880.	850 7 6	- - -	The surrender of leases which would have expired by effluxion of time on the 5th April 1887, and the 5th April 1896, respectively, and the expense incurred by the lessee in the erection of the buildings.	- - -	- - -	Erected on part of the site of several messuages and buildings which were previously demised with other premises at rents amounting to 581 l. 12 s. 3 d. per annum, and upon payment of fines amounting to 2,306 l.

26 June 1884 -	Part of the entrance to St. James' Hall, Piccadilly -	49½ years, from 5th April 1882.	A peppercorn for the first year, and 200 - - per annum during the remainder of the term.	-	The expense incurred by the lessees in the erection of the buildings.	Erected on part of the site of a house known as No. 29, Piccadilly, which was previously demised at a rent of 170 £, per annum and upon payment of a fine of 280 £. 10 s
18 Dec. 1884 -	The "Royal Standard" public-house, No. 227, Piccadilly.	22½ years, from 10th October 1882.	200 - -	-	The expenditure incurred by the lessee on the premises.	The site of this house was previously let upon a building lease with the sites of five other houses, at an unapportioned rent of 98 £. 18 s., and 15 £. 0 s. 4 d. in lieu of land tax.
15 Sept. 1885 -	The Annexe to the Holborn Restaurant in Little Queen-street, together with Nos. 220 and 221, High Holborn, and No. 1, Little Queen-street, then occupied as dwelling houses or shops.	75 years, from 5th April 1885.	575 - -	-	The expense incurred by the lessee in the erection of the Annexe, and a covenant to erect new buildings upon the site of the other buildings.	Nos. 220 and 221, High Holborn, No. 1, Little Queen-street, and the site of the Annexe with the houses that stood thereon, were previously demised with other premises at rents amounting together to 148 £. 8 s. 8 d.
16 Jan. 1886 -	An addition to the "Criterion," Jermyn-street	67 years, from 10th October 1883.	360 - -	-	The surrender of a lease which would have expired by effluxion of time on the 5th April 1891, and the expense incurred by the lessees in the erection of the building.	The site with two houses thereon known as Nos. 6 and 7, Jermyn-street, was previously demised at a rent of 39 £. 7 s. 1 d.
31 Dec. 1886 -	The Hotel Metropole, Northumberland Avenue, and Whitehall-place.	78 years, from 29th September 1884.	6,750 - -	-	The expense incurred in the erection of the buildings.	The greater part of the site was purchased from the Metropolitan Board of Works, subject to an agreement for the grant of a lease at a rent of 6,000 £. The remainder was part of a wharf and had been in hand for many years.
22 Feb. 1887	The "Duke of Argyll" public-house, No. 19, Little Pulteney-street.	78½ years, from 5th July 1885.	A peppercorn for the 1st year, and 154 - - per annum during the remainder of the term.	-	The expense incurred in the erection of the buildings.	For the improvements in Little Pulteney-street, a large number of houses in that and adjoining streets and courts were cleared away. Parts of the sites of the houses were thrown into the streets, and parts of the courts have now been built over. This house stands on parts of the sites of four houses, one of which had been previously let upon a short tenancy at a rent of 80 £, and the others had been leased with other houses, at an unapportioned rent of 124 £.

RETURN of Licensed Houses Leased by the Commissioners of Woods and Forests during the 10 Years ending 31st March 1892—*continued*.

Date of Leases.	PREMISES DEMISED.	Terms Granted.	New Leases.			Preceding Leases.		OBSERVATIONS.
			Rents.	Fines (if any).	Other considerations (if any) for Leases.	Rents Reserved.	Fines (if any).	
MIDDLESEX—continued.								
15 Jan. 1889	Nos. 6 and 8, Air-street, part of the "Café Royal"	56 years, from 5th July 1888.	£. s. d. 77 6 8 for the first year, and 95 — — per annum during the remainder of the term.	£. s. d. —	The surrender of leases, which would have expired by effluxion of time on the 5th January 1918 and the 5th July 1944 respectively, and the expense incurred by the lessee in the erection of the buildings.	£. s. d. —	£. s. d. —	The site, with two houses thereon, was previously demised at rents amounting to 77 l. 6 s. 8 d. per annum.
3 Jan. 1891	No. 23, Glasshouse-street, part of the "Café Royal"	53½ years, from 10th October 1890.	213 — —	—	The surrender of a lease, which would have expired by effluxion of time on 5th April 1893, and the cost incurred by the lessee in the erection of the building.	100 — —	250 — —	The site, with a public-house known as the "Union Tavern" thereon, was last let at a rent of 150 l. per annum, and on payment of a fine of 350 l., together equivalent to a rent of 175 l. per annum.
20 Jan. 1891	The "King's Arms," public-house, No. 32, Glasshouse-street.	21 years, from 10th October 1891.	100 — —	350 — —	The expenditure incurred by the lessee upon the premises.	100 — —	250 — —	
18 March 1891	The "George," public-house, No. 29, Brewer-street	21 years, from 10th October 1891.	100 — —	300 — —	The expenditure incurred by the lessee upon the premises.	70 — —	120 — —	
19 Aug. 1891	The "British Queen," beerhouse, No. 44, Cumberland Market, and an adjoining dwelling-house.	27 years, from 5th April 1891.	15 — —	—	The surrender of the lease mentioned in the next column.			The premises were held with other property for a term of 99 years, from the 5th April 1819. At the request of the lessees, a surrender was accepted, and a new lease of the premises granted to purchasers for the remainder of the term, at the rent stated, which is an apportionment of the rent reserved by the old lease.

17 Dec. 1890 -	"The Swallow," public-house, No. 6, Swallow-street	80 years, from 5th January 1890.	99 5 2 per annum to 5th April 1891 and 251 15 - per annum during the remainder of the term.	-	The surrender of leases, which would have expired by effluxion of time on the 5th April 1894, and the expense incurred in the erection of the buildings.	The site, with two houses thereon, was previously demised at rents amounting to 97 l. 10 s. 2 d. per annum.
20 Oct. 1890 -	SURREY. The "Wheatsheaf Hotel," with the stabling, out-buildings, and gardens containing about 2A. 1R. 23P., situated at Virginia Water, in the parish of Egham.	42 years, from 25th March 1890.	114 - -	-	The surrender of the leases mentioned in the next column, and the expenditure incurred by the lessee on the premises.	The premises were last let on two leases, for terms which would have expired by effluxion of time on the 29th September and 10th October 1902 respectively, at rents amounting together to 74 l. per annum.
19 Aug. 1885 -	WILTS. BROMHAM ESTATE. The "Bell Inn," with buildings and adjoining land, containing together about 5A. 1R. 19P.	21 years, from 10th October 1885, determinable by either party at the end of the fourteenth year, upon giving 12 months' notice.	40 - -	-	-	This inn and land were last let as part of a farm, containing about 143 acres, at an unapportioned rent of 200 l. 5 s. 4 d. per annum.
16 July 1886 -	A messuage and buildings thereon, known as the "Greyhound Inn," and land, containing altogether about 13A. 2R. 12P., situated in the parish of Bromham.	21 years, from 10th October 1885, determinable by either party at the end of the seventh or fourteenth year, upon giving six months' notice.	85 - -	-	-	-

Office of Woods, &c.,
29 March 1893.

Geo. Culley, } Commissioners of Her Majesty's
Nigel Kingscott, } Woods, Forests, and Land
Revenues.

LICENSES (WOODS AND FORESTS
DEPARTMENT).

RETURN showing the Number of LICENSED
HOUSES Leased by the Department of Woods
and Forests during the Ten Years ending the
31st day of March 1892; the Terms on which the
Leases have been Granted; and in cases of
Renewals, the Terms on which the Premises
were previously Held.

(Mr. Loder.)

Ordered, by The House of Commons, to be Printed,
30 March 1893.

[Price 1 d.]

MILLBANK PRISON.

RETURN to an Order of the Honourable The House of Commons,
dated 1 September 1893 ;—for,

COPY “of REPORT of the SURVEYOR on the Demolition of MILLBANK
PRISON by the UNEMPLOYED.”

Treasury Chambers, }
9 September 1893. }

JOHN T. HIBBERT.

(*Mr. John Burns.*)

Ordered, by The House of Commons, to be Printed,
19 September 1893.

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HODGES, FIGGIS, & Co., LIMITED, 104, GRAFTON STREET, DUBLIN.

COPY of REPORT of the SURVEYOR on the Demolition of MILLBANK
PRISON by the UNEMPLOYED.

MILLBANK.

17, Great George Street, Westminster, S.W.
28 July 1893.

Sir,

As we are now sending in our accounts of the sales of materials of this prison, we venture to submit the following short summary of the result of your scheme of having one of the blocks of Pentagons pulled down by unemployed labour without the intervention of a sale by auction or contractor.

The details of the scheme are set out in our letter to you of 3rd December 1892, and may be here briefly stated as empowering us to retain "No. 1" Pentagon, employ experienced foremen, timekeepers, and gangers, purchase the necessary tools, engage "the unemployed" at an hour's wage of $6\frac{1}{2}d.$, and finally to dispose of the materials when got down in any manner we thought most advantageous to the Government; while we for our part agreed to make no charge for the very heavy extra demands made upon our time by the conduct of such a scheme.

The work commenced on 14th December, when out of the large crowd outside the gates 49 men were engaged and set to work, and a week later this number was increased to over 100; the applicants were at this time taken quite indiscriminately from those nearest the gates, but later on some preference was shown to those who came armed with letters of recommendation from Mr. Wheatley (of the St. Giles Christian Mission), Clergy of any denomination, or old employers, &c.; at this time also there were daily demonstrations at Tower Hill of "the unemployed," and a suggestion of scarcity of work at the Docks, so we made enquiries as to the usual vocations and the residential locality of some 120 of the men, and learnt that about 90 per cent. of them were bricklayers' labourers, an unskilled trade which just then was disorganised by the stoppage of work on several large buildings, in consequence of frost and the failure of the Liberator Society, while the other 10 per cent. was made up of stonemasons, ironworkers, navvies, gardeners, discharged soldiers, and one docker.

The localities they came from were:—

Chelsea, Battersea, Lambeth, Camberwell	-	-	55
Pimlico and Westminster	-	-	11
Fulham, Kensington, Notting Hill, and Marylebone			17
Clerkenwell	-	-	14
Borough	-	-	14
Stepney	-	-	6
St. Luke's	-	-	2
Kentish Town	-	-	2
Deptford	-	-	1

122

by which you will notice that about 80 per cent. lived within a two miles' radius of Millbank.

The men worked very fairly at first, though from their ignorance of the proper methods the results achieved were inadequate; but as time went on they drifted away to other and more congenial works. We believe that, although the wages paid to them were hardly more than half what the regular pullers-down demanded, in very few instances did a contractor engage them or consider that there would be any economy in doing so,

The

The wages paid out from first to last amounted to 1,644*l.*, and during December, January and February averaged 106*l.* a week (but for the bad fogs and wet then experienced this would have been materially increased); and we think you can congratulate yourself on initiating a work which certainly relieved a large amount of local temporary distress.

The employment of so much unskilled labour made us extremely anxious as to accidents, but we are thankful to report that no serious injuries were experienced, and that though a few men had to go to the hospital, in nearly all cases they were able to come back to work after a few days, and during the time they were away we thought we should be correctly interpreting your wishes in making them a compassionate allowance.

The disposal of the materials gave us a great amount of trouble; the lead of course was easily sold, but the stone paving and landings were difficult to dispose of. The bricks especially at one time seemed likely to hinder us; we had to make it known at the auctions that we would not sell any to outside parties, as otherwise there would have been no dealers disposed to purchase those of the remaining Pentagons, but finally we arranged the sale of all we had up to 2,000,000 to Mr. Tate for the foundation and inner walls of his gallery, our contract being to clean and stack only whole bricks at 20*s.* a thousand; and as to this, the final measurements showed that 1,946,500 were altogether stacked.

As an instance of the different way men work, when by the hour or by piece work, we may state that whereas the cost of cleaning and stacking by the unemployed averaged from 12*s.* to 13*s.* a thousand, on two occasions when gangs of the same men were employed by piece work they managed to earn higher wages than before, although the rate agreed on was only 7*s.* a thousand, and later on when men were scarce, a dangerous piece was let to a skilled gang, who found it profitable at 8*s.* 6*d.* a thousand.

We are pleased to draw your attention, however, to the fact that, although we had so many difficulties to contend with, the nett profit of the sale of "No 1" Pentagon, after paying for the labour, tackle, tools, &c., is about 1,060*l.*, while the average sum realised for the remaining five Pentagons was under 1,000*l.*, which we think goes far to prove that we obtained as much as possible for the materials.

In other ways the scheme proved of use in assisting us to dispose advantageously of the other materials, as when for instance the brick buyers combined to obtain at nominal prices the lots of bricks, confident that, with the clamour for providing work for the unemployed, we should not dare to refuse to sell; in this case we bought in several lots on account of "No 1" Pentagon account, and threatened to work them all with unemployed labour. We were also enabled to sink test-holes in order to ascertain the character of the subsoil, and to make a new roadway when the gateway was being removed.

The anxiety and trouble involved in the carrying out of the scheme has been very heavy: for instance, the daily paying of the men involved the loss to us of the time of a senior clerk every day after 2 o'clock for six months; but we are not anxious to dwell on this, as we shall consider ourselves fully repaid if you can assure us that you are satisfied with the execution of a work which we have carried out to the best of our abilities.

We remain, &c.
(signed) *Horne, Son & Eversfield.*

The First Commissioner,
Her Majesty's Works and Public Buildings.

MILBANK PRISON.

COPY of REPORT of the SURVEYOR on the
Demolition of MILBANK PRISON by the
UNEMPLOYED.

(*Mr. John Burns.*)

Ordered, by The House of Commons, to be Printed,
19 September 1893.

[*Price 1 d.*]

ORDNANCE SURVEY.

R E P O R T

OF THE

DEPARTMENTAL COMMITTEE

APPOINTED BY

THE BOARD OF AGRICULTURE

TO INQUIRE INTO THE

PRESENT CONDITION

OF THE

ORDNANCE SURVEY:

WITH

COPY OF THE MINUTE APPOINTING THE COMMITTEE.

Presented to both Houses of Parliament by Command of Her Majesty.



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1893.

ORDNANCE SURVEY COMMITTEE.

TERMS OF REFERENCE.

THE Board propose that a Departmental Committee be appointed to inquire into and report upon the present condition of the Ordnance Survey, and especially to consider—

- (1.) What steps should be taken to expedite the completion and publication of the new or revised 1-inch map (with or without hill-shading) of the British Isles?
- (2.) What permanent arrangements should be made for the continuous revision and speedy publication of the maps (1/500 (towns), 25-inches, 6-inches, and 1-inch scales)?
- (3.) Whether the maps as at present issued satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed, and price; and whether any improvement can be made in the catalogue and indexes?

The Board further propose that the Committee consist of the following gentlemen viz. :—

Sir JOHN EDWARD DORINGTON, Baronet, M.P., Chairman.

Sir Archibald Geikie, F.R.S., F.G.S., &c.

Lieut.-General Anthony Charles Cooke, C.B., R.E.

Mr. Henry William Primrose, C.S.I.

Mr. William Mather, M.P.

Mr. Henry John Roby, M.P.

Mr. Charles Fortescue Brickdale.

Major Duncan A. Johnston, R.E., will act as the Secretary to the Committee.

Approved and ordered,

(Signed) HENRY CHAPLIN.

Board of Agriculture,
26th April 1892.

On the 11th May 1892, the Board of Agriculture referred to the Committee the following question asked in the House of Commons :—

Mr. Thomas Ellis, M.P. "To ask the President of the Board of Agriculture whether he is aware of the dissatisfaction existing amongst Welsh scholars, geologists, and others with the inaccuracy and incompleteness of the place names in the Ordnance Survey maps of Wales, and whether he will take steps to secure the aid and co-operation of Welsh scholars to ensure accuracy in the nomenclature of these maps."

The under-mentioned witnesses were examined by the Committee in the order here stated :—

Col. Sir C. Wilson, K.C.B., &c., &c.	Director-General of the Ordnance Survey.
Mr. H. T. Crook, C.E.	- A Civil Engineer who has given much attention to the maps of the Ordnance Survey.
Mr. J. Bartholomew	- Map producer.
Mr. J. Wyld	- Map agent and map producer.
Mr. E. G. Wheler	- Commissioner to His Grace the Duke of Northumberland.
Mr. E. Stanford	- Sole agent for sale of Ordnance Survey Maps and map producer.
Mr. G. H. Johnston	- Map producer.
Mr. T. Currie	- Of the firm of Keith Johnston & Co., map producers.

Sir A. Geikie, F.R.S., &c., &c.	Director-General of the Geological Survey.
Mr. R. Morham -	City Architect of Edinburgh.
Mr. A. Murray -	City Surveyor of London.
Mr. W. S. Till -	City Surveyor of Birmingham.
Major Duncan A. Johnston, R.E.	Secretary to the Committee.
Mr. G. F. Chambers -	A barrister, Lieut. 1st Sussex Vol. Royal Engineers. A gentleman who has made a special study of Ordnance Maps in the three south-eastern counties. An Assistant Commissioner under the L. G. B. Act, 1887.
Mr. R. Elliott Cooper -	A Civil Engineer who has largely used the Ordnance Survey and some foreign maps.
Mr. G. H. Leane -	A Civil Engineer and Surveyor who has made large use of the Ordnance Survey Maps.
Sir G. Leach, K.C.B.	Formerly employed on the Ordnance Survey in Ireland, on the Copyhold, Enclosure, and Tithe Commission, and recently Secretary to Her Majesty's Board of Agriculture.
Mr. G. Broom -	Borough Surveyor of St. Helens.
Mr. H. H. Fuller -	A Land Agent and Surveyor.
Mr. J. Allison -	City Surveyor of Manchester.
Mr. C. Tomes -	Borough Surveyor of Eastbourne.
Mr. E. Ryde -	Late President of the Surveyors' Institution.
Mr. S. Wilkinson -	A barrister and journalist who has made maps a special study.
Mr. G. Lewis, M.I.C.E.	Past President of the Midland Counties Institution of Mining Engineers.
Mr. D. Freshfield -	Honorary Secretary to the Royal Geographical Society.
Capt. J. Wharton, R.N.	Hydrographer to the Admiralty.
Mr. A. R. Binnie -	Chief Engineer to the London County Council.
Professor J. H. Merivale -	Mining Engineer.
Gen. J. T. Walker, C.B., F.R.S., R.E.	Formerly Surveyor-General of India.
Mr. C. F. Brickdale -	Of the Land Registry.
Major-General R. O. Jones, C.B., R.E.	A Welsh scholar and formerly employed on the Ordnance Survey in Wales.

In addition to the above oral evidence the Committee obtained statements in writing from a large number of civil engineers, borough surveyors, land agents, and others, also from the Valuation Office in Dublin (*see* Appendix II.), and studied a considerable amount of documentary material.

They also visited the Ordnance Survey Office at Southampton.

On the 11th November they presented an Interim Report on Revision, the substance of which is again repeated in the following pages, and a copy of which will be found in Appendix A., page xli.

REPORT.

I.—HISTORY OF THE ORDNANCE SURVEY.

We think it desirable, in order that our Report on the questions referred to us may be more fully understood, to commence by giving a brief sketch of the history of the Ordnance Survey, its present condition, and the processes in use, confining ourselves mainly to points bearing on the subjects remitted to us.

The history of the Ordnance Survey may be divided into three periods, viz. :—

- (1.) What may be called the Early Period, during which surveys were limited to the scale of 1 inch to a mile.
- (2.) What may be termed the Intermediate Period, during which surveys on scales of 1 inch and 6 inches to a mile were carried out.
- (3.) What may be named the Modern Period, during which surveys have been carried out on the system and on the scales which are now in use.

The Early Period of the Survey may be said to have begun with the measurement of a base-line on Hounslow Heath in 1784. In 1791 a trigonometrical survey of England was ordered by Parliament, and in 1797 a survey on a scale of 1-inch to a mile for military purposes was commenced. This survey was more or less regularly proceeded with till 1824, by which date the whole of the south of England and part of Wales had been completed on that scale.

The Second or Intermediate Period began in 1824, when, for purposes connected with land valuation in Ireland, maps of that country were required on a larger scale than the 1-inch. An Irish survey was therefore commenced on a scale of 6 inches to a mile. This, which was in part merely a skeleton survey, was completed in 1840. The result, however, was so satisfactory that a demand arose for maps on the same scale for England and Scotland. The Treasury therefore ordered that the six northern counties of England and the whole of Scotland, being the portions of Great Britain not hitherto surveyed on any scale, should be surveyed on the 6-inch scale. The 1-inch survey of England having at that time reached as far north as a line through Preston and Hull, its further progress was then stopped. It was decided that the 1-inch map should in future be produced by reduction from the larger scale. Lancashire, Yorkshire, and six counties in Scotland were surveyed accordingly on the 6-inch scale, and many of the towns in these districts were surveyed on the scale of 5 feet to a mile.

In the meantime considerable discussion arose as to the best scale for the Survey. Finally a Committee appointed in 1854 recommended the adoption of the scales now used by the Ordnance Survey, viz., plans on a scale of 10·56 feet to the mile (1/500) for towns of 4,000 inhabitants and over, of 25·344 inches to the mile (1/2500) for cultivated districts, of 6 inches to the mile (1/10,560) for the Highlands of Scotland and thinly cultivated districts, and of 1-inch to the mile (1/63,360) for the whole country. These recommendations were adopted by Parliament, and the Treasury Order authorising them was issued to the Ordnance Survey in 1855. The Intermediate Period may therefore be said to have lasted from 1824 to 1855.

It should be mentioned, however, that during these two earlier periods of the Survey a most important and laborious part of the work, which gave, nevertheless, no immediate results in the production of maps, had been proceeding. This was what is called the Principal Triangulation. Begun towards the end of the last century, this branch of the Survey had by 1852 carried a network of triangles over the three kingdoms. The work was entirely a military one, having been carried out by Colonel Colby and officers of the Royal Engineers. Although intended only for a small-scale military map, it was fortunately conducted with a scientific accuracy which was at that time unknown in connection with the surveys of European countries, and which has enabled the subsequent operations of the Survey, even for the largest scales, to be completed without the slightest question as to the soundness of the basis on which they are founded.

The work done by the Ordnance Survey during the first and second periods of its existence, extending over about 70 years, may be roughly summarised as follows:—

Six base lines had been measured and the principal triangulation had been completed over the three kingdoms; maps on a scale of 1 inch to a mile had been completed for about two-thirds of England and Wales; maps on a scale of 6 inches to a mile had been completed for the whole of Ireland, for Lancashire and Yorkshire, and for six counties in Scotland, and plans on a scale of 5 feet to a mile had been made for many of the towns in the districts which had been surveyed on the 6-inch scale.

The Third or Modern Period of the Ordnance Survey dates from 1855, when for the north of England and for Scotland the 6-inch scale was adopted for the plans of uncultivated districts, the 1/2,500 scale (25·344 inches to the mile) for the plans of the cultivated districts, and the 1/500 scale (10·56 feet to the mile) for towns of 4,000 inhabitants and upwards. The survey has been carried out on these scales ever since, except during the interval familiarly known as that of “The Battle of the Scales” in 1857–8, when the Treasury Order of 1855 was recalled by Parliament for a time.

In 1858 a Royal Commission recommended the resumption of the 25-inch scale, and that the 6-inch scale, instead of being confined to the Highlands of Scotland and uncultivated districts, should be published for the whole district then under survey, with the exception of the Highlands of Scotland, which were to be surveyed only on the 1-inch scale.

In 1862 the scales recommended by the Royal Commission of 1858 for the four northern counties were adopted for the rest of England, except the portions which had been surveyed on the 6-inch scale.

WORK DONE BY THE ORDNANCE SURVEY IN THE MODERN PERIOD.

The work done by the Ordnance Survey since 1855 may be roughly summarised as follows:—

Over 14,000 plans of towns in Great Britain and Ireland have been published either on the scale of 5 feet or 10 feet or 10·56 feet to a mile.

Surveys on the 1/2,500 scale (25·344 inches to a mile) of the cultivated districts of England and Wales have been completed except for a small portion of Lancashire and Yorkshire which will be completed by 1894. Over 43,000 plans on this scale have been published.

All Scotland has been published either on the 1/2,500 or on the 6-inch scale. The 1/2,500 scale survey of the cultivated districts has been completed except in the case of the six counties originally published on the 6-inch scale; these will be finished in 1897, when the 1/2,500 scale survey of the cultivated parts of Great Britain will be completed. Over 9,000 plans of Scotland on the 1/2,500 scale have been published.

In Ireland the 1/2,500 scale survey has only recently been started, but upwards of 800 plans have been published.

The 6-inch survey of the United Kingdom and Ireland has been completed, and the larger part of this map in Ireland has been revised.

The “new series” 1-inch map of England, which commenced north of the Hull Preston line, already referred to (p. v), and which has since been extended to the whole of England, has been published in two forms, (1) in outline only, (2) with hill features; of the former two thirds have been completed; of the latter 84 sheets out of 360. The whole will be completed in outline as an engraved map in 1896. An advance or temporary edition by photo-zincography of this outline map has been published of all portions which will not be completed in the engraved form by the end of the present year (1892), with the exception of the uncompleted portion of South Lancashire and Yorkshire, of which the field survey is not yet finished. In Scotland the 1-inch outline map is complete and the hill-shaded map practically so. In Ireland the 1-inch outline map is complete and the 1-inch hill-shaded map is nearly completed.

It may be desirable here to state the difference between what are termed the “old series” and the “new series” of the 1-inch map.

The old series was commenced, as has been above stated, at the beginning of this century in the south of England, and was continued uninterruptedly until 1824, when most of the surveyors were transferred to Ireland. When the mapping was resumed after 1840, by which date the survey had reached the line already alluded to as running approximately through Hull and Preston, the decision was taken to survey the remainder of England on the 6-inch, and at a later period on the 25-inch scale, and to produce the 1-inch map by reduction from these scales.

The preparation of the 1-inch map was then continued, but with important differences. The old map had been constructed on six different meridians; the new one had only one meridian, which was made use of for the whole of England. The old series map was published in sheets, 36 inches by 24 inches, but many of the sheets were issued in "quarter-sheets" one fourth of these dimensions. The new series of 1-inch maps was published entirely in quarter sheets, *i.e.*, 18 inches by 12 inches. The old map had been published in one form only; the new one was in two forms, one in outline, the other with hill features. The old map was based on a 2-inch survey, the new one on 6-inch and 25-inch surveys. The sheets of this new map were, in the first instance, numbered as a continuation of those of the old map and considered as its completion. The northern counties were completed in 1870.

In that year the War Office, having pointed out the defects of the old 1-inch map, which represented the whole of the country south of Preston and Hull, Treasury authority was obtained to supersede that map altogether by a new 1-inch map, to be reduced from the larger scales as they proceeded, and to be drawn on the same projection and published on the same system as the portion which had already been produced north of the line through Preston and Hull. The sheets of the newly-authorised 1-inch map for the south of England being identical in size and construction with those of the old map north of the Hull-Preston line, the two were incorporated together, forming the "new series" 1-inch map. In order to carry this out Sir H. James, the then Director-General, re-numbered the sheets of the old map north of the Hull-Preston line commencing with No. 1, Berwick-upon-Tweed, and carrying on the numbering continuously to the south of England, so as to include the new portions. Thus as regards the northern portion of the 1-inch map, the change from old to new series means no more than a re-numbering of the sheets. This change has led to some doubt as to whether these northern sheets were properly transferred from the old to the new series. There can, however, be no doubt, when their method of production, projection, &c., are considered, that the course adopted was a correct one, and that these maps are now rightly classed in the new series.

It will be seen that the work done by the Ordnance Survey since 1855 is entirely new, the only part of the earlier work utilised for the new surveys, which will be completed in 1897, being the Principal Triangulation. The whole of the old 1-inch and 6-inch surveys extending over some 60 or 70 years have, with some exceptions insignificant in proportion to the area of the whole, been put aside, and the country has been surveyed anew since 1855 on a different system.

METHODS AND PROCESSES OF THE ORDNANCE SURVEY.

The methods and processes employed by the Ordnance Survey may be briefly stated as follows:—

Before the actual survey commences the triangulation has to be made. Starting from a base-line the country is covered with a network of triangles. The primary triangulation has long since been finished, and with such accuracy that when the length of the Salisbury Plain base-line was computed from an Irish base-line 350 miles distant, the computed length only differed from the measured length by a few inches. The primary triangulation was broken up into secondary and tertiary triangulation, the latter giving points averaging about a mile apart. In the case of towns a still smaller triangulation is made with points averaging $\frac{1}{4}$ to $\frac{1}{2}$ of a mile apart. The triangulation forms an absolutely accurate framework on which the subsequent survey operations are based.

Another preliminary to the actual survey is the ascertaining of boundaries. Before the survey of any district in England is commenced the Ordnance Survey perambulates the boundaries assisted by meresmen selected by the parishes affected, and appointed by the Justices at Quarter Sessions. Similar arrangements are made in Scotland. Disputed points are investigated by reference to old maps and the best evidence, documentary or other, which is procurable. A full report on the points in dispute is made out and the boundary is then settled for Ordnance Survey purposes. Before, however, the boundaries are definitely settled they are publicly exhibited, opportunity being thus given for objection to be made before the boundaries are adopted. In Great Britain the boundaries, as ascertained by the Ordnance Survey, have no legal status, although in most cases they are accepted. In Ireland they are legally recognised by Act of Parliament.

The actual surveying of each district is entrusted to a localised branch of the Ordnance Survey placed in a convenient position and called a Division Office.

The survey is a chain survey. A triangle of the tertiary triangulation is allotted to each surveyor, and he makes a chain survey of all the detail contained in this triangle; the surveyor does not plot his survey, and indeed has not the means of doing so. He records his survey in a field book, which is sent in to the Division Office, where the lines are laid down by another man. If the lines do not plot within a limit of error of two links in the 1,000, equivalent on the $1/2,500$ -scale to about $1/500$ of an inch, the line is sent back to the surveyor to be re-measured.

When the discrepancies have been corrected, the survey is plotted in the Division Office. The plotting is therefore quite distinct from the survey, and carried out by a separate staff.

When the plotting of a plan is completed, it is traced and sent to a separate party of men known as "examiners." These test all the detail, correcting any errors or distortions they may find; they ascertain the names, recording the authorities for each on sheets which are retained for future reference; they ascertain the state of cultivation of each field, &c., identify boundaries from the boundary documents which have been prepared in the manner already described, and generally speaking obtain all the information necessary to complete the plans.

These examiners' tracings are carefully checked by a "final examiner," after which they are sent in to the Division Office.

The plans are drawn in the Division Office, they are then examined, and any doubtful points as to names, &c. are referred to the field examiners for further investigation.

The areas are then computed, and after examination in the field by an officer, the plans are sent to the Levelling Division, where the levels and bench-marks are inserted, and thence to Southampton.

On arrival at Southampton the plans are closely examined, both as to detail and areas. The object of this examination is to secure uniformity in style and execution in the different divisions, to detect errors which may have crept in in drawing the plans or in computation, to see that the names are properly vouched for, and that the same names are spelt alike unless there are good reasons to the contrary, to see that well-authenticated antiquities and other objects of interest are shown on the plans, &c., &c. Doubtful points are referred back to the division which made the survey.

When all doubtful points have been settled the plans are sent forward for publication.

The original plan, whether on the 10·56-foot or 25·344-inch scale, is published either by zincography or photo-zincography.

For the former a tracing is made in transfer ink on specially prepared paper, on which trees, &c. are stamped, and names are either written by hand or stencilled. This tracing is called a "transfer." The "transfer" is laid down on zinc and a proof is taken. This proof is compared with the original, corrections, if necessary, are carried out on the zinc plate, and the required number of copies is printed. The paper on which the maps are printed is marked when dry before printing, and each map after printing is again measured. Any maps exceeding a limit of error in measurement of $\frac{1}{16}$ th of an inch are condemned. In very damp weather a plan will expand about $\frac{1}{16}$ th of an inch.

The MS. plans intended for reproduction by photo-zincography are drawn in a style suitable for this purpose. Instead of being traced in transfer ink they are photographed and a "photo transfer" is taken in transfer ink. This is laid down on zinc and printed in the same way as zincographed plans. This method has the advantage of being more rapid, and, the plan being an exact reproduction of the MS. plan, there is less chance of error.

A certain number of copies of each edition are coloured by hand. In the case of some towns cross-ruling or hatching has been substituted for colouring. This is done by sensitising the zinc plate with a weak acid solution after the detail has been "transferred." The whole of the plate, except the portions intended to be hatched, is then "stopped out" by putting on a solution with a brush. A "transfer" from a cross-ruled plate is taken and laid down on the zinc plate, the transfer ink taking the sensitive parts of the plate, but not those "stopped out." The plate is then etched with a weak solution of phosphoric acid and nut galls.

The sensitising with acid is a very delicate operation, and to some extent injures the grain of the plate, and with every care hatched plates are necessarily rather coarser than others. The stippling used on the 6-inch maps to indicate parks is similarly transferred.

Reduction from the town scale to the 25·344-inch scale is carried out by photography. As, however, the reduced photograph shows too many details to be clear, a cyanotype or blue print is taken on drawing paper, on which the detail to be reproduced on the smaller scale is penned over in black, and the names, &c. are stamped in type of suitable size. The plan is then photographed, when the lines, &c. in black are reproduced, but those in blue are not, as that colour will not photograph.

Reduction to the 6-inch, 1-inch, or smaller scales is similarly carried out by photographic reduction, only such detail as is required to appear on the reduced map being penned in in black on the blue print.

Although a considerable portion of the 6-inch map has been engraved, engraving is now mainly confined to the 1-inch and smaller scales. The copper-plate having been engraved, a matrix is taken by the electrolytic process, and from the matrix a duplicate is made. The duplicate is an exact facsimile of the original. It is used to print from instead of the original, and when it is worn a second or any required number of duplicates can be taken from the matrix. The life of the copper-plates is further preserved by steeling and nickeling. The hill-shading of the 1-inch map was formerly engraved on the original plate, but recently the plan of having a separate plate for the hill-shading has been introduced. This enables the hill features, if desired, to be printed in a different colour from the detail.

It is impossible except at great length to describe fully all the processes employed by the Ordnance Survey; the description given above will, it is believed, suffice to make clear the points touched on in our Report.

This completes the history of the Ordnance Survey and of the processes in use.

I.—FIRST HEAD OF REFERENCE.

What steps should be taken to expedite the completion and publication of the new or revised 1-inch map (with or without hill-shading) of the British Isles?

We consider that the chief reasons for the delay which has occurred in the production of the new 1-inch map of England, and which has been so much complained of, is due to the enormous development of large-scale maps, and to the decision, first come to in 1840, that in future the 1-inch map should be produced by reduction from the larger scales.

It seems natural that the main energies of a public department should be devoted to that work which the Executive, acting as the exponent of Parliamentary views, indicates as its principal object. It is certain that, especially since 1880, the production of large-scale plans has been the principal object laid down for the Ordnance Survey Department. In that year, owing to pressure for a cheap system of land transfer, Her Majesty's Government authorised the doubling of the Survey establishment in order to enable the cadastral plans of England to be completed by 1890. This large work, involving an expenditure of upwards of a million sterling, was carried out in the manner in which it was intended within the time and cost which had been estimated, but Lancashire and Yorkshire, being already in possession of a 6-inch map, were not included in the above authority, and their 25-inch map was not begun until the survey of the remaining counties had been finished. Thus the 1-inch map is still waiting for the completion of the surveys in these counties.

Whilst the decision to produce the 1-inch map by reduction from the larger scales instead of by attempting to revise the "old series" 1-inch has resulted, as was intended, in a more certain accuracy of detail than would otherwise have been obtained, this course has necessarily produced delay. For instance, the "old series" maps of Devonshire were published in 1809. They were defective; and inferior in accuracy to most of the "old series" maps. Yet this county is not yet in possession of its "new series" engraved 1-inch maps, owing to its cadastral survey being one of the latest to be completed. Until the production of a photo-zincographed advance edition in 1892, this county had no more recent 1-inch map than that of 1809.

The 1-inch map of England will be published in outline, either in the engraved or photo-zincographed form, by the end of this year (1892), with the exception of the above-mentioned portion of Lancashire and Yorkshire, for which the field survey will be nearly if not quite completed next year (1893). We consider that this outline map, being so near completion, should continue to be produced in the same way as hitherto, and we approve of the course which the Survey Department has taken in producing an advanced edition by photo-zincography so as to complete the map for the whole country this year. This edition, though necessarily rough, is satisfactory for its temporary purpose. This temporary character might with advantage be more distinctly indicated on each sheet. The meaning of the expression "Advance Edition," now put on the maps, would be made clearer if the word "Temporary" were prefixed to it.

As regards the hill-shaded map, it does not appear practicable, by present methods, owing to the difficulties attending on hill engraving, to complete the map with hills in its finished form before 1910, although it is intended that a temporary advance edition by photo-zincography shall be completed by 1900. The question of whether a more rapid process than that of engraving could be introduced for the hill features of the 1-inch map is discussed at pages xviii. and xix.

The 1-inch maps of Scotland and Ireland are completed in outline, and the hill-shaded maps of these countries are approaching completion. We consider that with regard to them no further steps are necessary.

II.—SECOND HEAD OF REFERENCE.

What permanent arrangements should be made for the continuous revision and speedy publication of the maps (1/500 (towns), 25-inch, 6-inch, and 1-inch scales).

The want of revision, and in consequence the obsolete character of many of the maps has been strongly brought out in evidence, and is one of the most serious questions which the Committee have to consider. This subject divides itself into the revision of (a) the 1-inch map, and (b) that of the larger scales, and we will deal with them separately.

a.—REVISION OF 1-INCH MAP.

As regards the 1-inch Ordnance map, the "old series" map of England was completed by 1844, and, with the exception of the addition of railways, has never been touched since. The "new series" 1-inch map will, as already stated, be completed without hills either in the engraved or photo-zincographed form in the course of this year for the whole of Great Britain, except a part of South Lancashire and Yorkshire, and in the engraved form without hills for the whole country by 1896.

The new 1-inch map in the northern parts of Lancashire and Yorkshire is based on the 6-inch scale which was surveyed between 1840 and 1857, and has not been revised since. For the rest of England it is based on the 1/2,500 scale (25·344 inch) survey,

a few parts of which were surveyed over 30 years ago. Some parts of this map, representing as they do surveys extending from 50 years ago to the present time, are therefore in urgent need of revision. It is only with this new series that we are concerned, for the old series, as already stated, is being entirely superseded.

The evidence of Sir Charles Wilson satisfies us that there need be no difficulty in bringing this new series map up to date at a reasonable cost. He estimates (see Appendix B., page xli.) that, if the revision of the 1-inch map is carried out independently of that of the larger scales, it can be brought up to date in four years' time at an expenditure of £7,000 or £5,500 per annum (according as the Highlands of Scotland are or are not included), in addition to present expenditure, which amounts to about £2,000 per annum. He further anticipates that, when once brought up to date, a comparatively small annual sum, probably not exceeding £1,000 or £2,000 per annum for field work, will suffice to secure the constant revision of this map, provided that arrangements can be made for the supply to the Ordnance Survey of information by local authorities or by the Board of Trade of alterations to roads, canals, docks, important extensions to towns, and large engineering works, just as notice of alterations to railways are at present supplied to the Ordnance Survey by the Board of Trade.

We consider that the Highlands should be included in this revision.

The revision of the Irish 1-inch map has been in progress for some years, and is still going on.

The 1-inch map is the one most used by the public for general purposes, both military and civil. We recommend strongly that its revision be carried out at all times independently of that of the larger scales, and that whatever funds are necessary should be provided to carry out these recommendations at as early a date as possible.

We further recommend that while railways, roads, and conspicuous works, or such other alterations as can properly be shown on the 1-inch scale, should always be inserted at as early a date after their completion as practicable; the revision should be so arranged that the whole country should be gone over and the map brought up to date within periods of 15 years; that each map should bear the date to which it is corrected or revised, and that no map be allowed to be sold by authorised agents which bears on its face a date of publication or revision older than 15 years.

We find on inquiry that in France the staff map (1/80,000), which is the basis of the other French maps, has its revision cared for annually by the staff of the Army in such manner that about one-tenth of the country is dealt with each year. The method adopted in that country will be found detailed in Appendix VIII. to this Report in a series of answers which General Derrécagaix, Director-General of the Geographical Department of the French Army, has been obliging enough to send to us in reply to inquiries which we made through the Foreign Office.

The method adopted in Germany will be found stated in Sir C. Wilson's evidence, answer 5676.

b.—REVISION OF LARGE-SCALE MAPS.

It may be convenient to re-state here that the large-scale maps produced or to be produced by the Ordnance Survey are:—

- (1.) Maps of towns of over 4,000 inhabitants on one or other of the following scales: 5 feet to a mile (1/1,056); 10 feet to a mile (1/528); or 10·56 feet to a mile (1/500). The latter is the one now adopted.
- (2.) A map on the scale of 25·344 inches to the mile (1/2,500) of all cultivated districts in Great Britain and Ireland.
- (3.) A map on the scale of 6 inches to a mile (1/10,560) of the whole of Great Britain and Ireland.

These large-scale maps may all be properly described as cadastral maps.* But the Committee of 1862 applied the term "cadastral" to the 1/2,500 scale only.

The term "cadastral survey" has unfortunately not always borne the same meaning, and this has led to misapprehension in the mind of the public as to what is taking place in the way both of survey and of revision. It has recently, in accordance with the view of the Committee of 1862, been considered to apply only to such scales as the 1/2,500 scale, on which areas can be calculated to within one-thousandth of an acre, but the term has also been applied to the 6-inch scale maps, and Sir H. James in his report of 1872 refers to the survey of the "mountainous part of Ross-shire" as part of the cadastral survey. As not much more than one-third of Scotland is

* A cadastral map is one on a scale sufficiently large to enable the area of every plot of ground to be measured upon it. The term is derived from the French word "Cadastré," the nearest equivalent to which in English is parish terrier or valuation list. The map to which the cadastre refers is called the "Carte cadastrale."

surveyed on the 1/2,500 scale, it is plain that the greater part of the "cadastral survey" of that country is on the 6-inch scale. The survey of Ireland on the 6-inch scale is also called "cadastral."

It appears from the evidence that some of the public have not unnaturally taken the term "cadastral survey" to apply to the 1/2,500 scale only, and are disappointed that the 1/2,500 scale plans of Lancashire, Yorkshire and the six Scotch counties were not completed by 1890 (Q. 775), as had been supposed to have been promised. There is no doubt that the re-survey of these counties on the 25-inch scale was not authorised by the Report of the Parliamentary Committee of 1862, on which the subsequent operations of the Ordnance Survey were based, and it consequently was not included in the work estimated to be completed by 1890; but the misunderstanding is to be regretted.

Proceeding on the assumption that the "cadastral survey" of Great Britain was completed in 1890, the work of substituting the 1/2,500 scale for the 6-inch scale in the eight counties just mentioned has been called "revision." We are of opinion that this term is inappropriate. The Director-General has stated in evidence that the work done in producing the 1/2,500 scale plans of Lancashire and Yorkshire has amounted in many parts to re-survey. We recommend that in future the term "revision" should only be applied to the bringing up to date of a map on the same scale on which it was originally drawn, and that "re-survey" should be the term applied to the work now in progress in Lancashire, Yorkshire and in Scotland; as well as to the production of the 1/2,500 scale maps of Ireland.

We find that while the large-scale maps are excellent in quality and fully meet the purposes for which they were designed, the very largeness of the scales necessarily leads to their rapidly getting out of date. It is obvious that where a map possesses much minuteness of detail it is much more affected by changes than a map, on a smaller scale, which only deals with leading features of the ground that cannot be easily or frequently disturbed. Consequently while the old 1-inch map is still an excellent one for many parts of the country, although much of it is 70 years old, the 6-inch maps drawn between 1840 and 1850 are in some districts nearly useless. This defect is more apparent in the 25·344-inch plans surveyed since 1854, and still more so in the town plans on the scale of 5 feet, 10 feet, and 10·56 feet to the mile. Scarcely any of them have been revised, and it is urgently necessary that the advantage of so splendid a work, as these maps of Great Britain and Ireland undoubtedly are, should not be destroyed for want of a regular system of revision.

No country at the present time possesses anything as perfect and complete as our cadastral survey, published by the authority of the Government, and available at a moderate price to every person in the Kingdom, showing every plot of ground and every isolated building, and having the new 1-inch map founded on it by the accurate copying power of the photographic lens.

C.—REVISION OF THE 25-INCH AND 6-INCH MAPS.

It has been shown in a previous paragraph that some of the 25-inch plans date from 1855, and have not been revised since. We have received evidence of the great cost entailed if the plans of the Ordnance Survey are allowed to remain for too long a period without revision, necessitating in some cases almost re-survey. It is evident that the revision of the 25-inch survey should be commenced without delay. We have the evidence of the Director-General that, if the revision of Great Britain is begun next year, it can be completed in 10 years at an extra expenditure of £630,000, and that a delay of even a year will materially increase the cost. The sum required for next year (1893-4) is £16,000, and we strongly recommend that this sum be provided. The detail of this subject will be found in Appendix C., page xlii. of this Report.

As soon as this revision has been completed, we think it very desirable that arrangements should be made for revising the maps every 15 years; the cost of this periodical revision is estimated at about £55,000 a year for field work. These sums would be diminished by the difference of cost between revision on the 10-foot and 25-inch scales, if, as proposed later on, the town-scale ceases to be a charge on the Ordnance Survey.

The 6-inch maps of Ireland have been under regular revision, and the 25-inch map has only just been commenced.

As bearing on this difficult subject of revision we feel bound to say that we are much impressed with the enormous mass and intricate detail of the work involved in the creation of the cadastral survey, and especially in that portion of it which includes

the town plans. We believe that this feature of the survey work is not generally realised or understood by the public.

The number of originals of maps from which copies are published and on sale to the public, and of indexes partaking more or less of the nature of maps, amounted on the 14th April 1892 to the large number of 88,643, besides many special maps produced for the War Office and other public departments, and every year the number of maps becomes greater. Impressions of all of the maps above quoted are on sale to the public.

Foreign countries do not publish any general plans on a larger scale than about 3 inches to a mile. Those countries which have a cadastral survey do not as a rule publish it; the maps are kept in manuscript, and tracings are supplied on payment to persons requiring them. It is believed that no foreign country publishes more than a few thousand sheets.

The great number of maps published by the Ordnance Survey considerably increases the cost of revision, and this number is due to the large scales employed. The following is the number of originals of sheets on the different scales for England; the greater part of these are published and on sale, and the remainder will follow on completion, as already stated:

1-inch scale, new series, 360 sheets		
6-inch "	{ 1,616 full sheets	These extend over the whole country, and cover practically the same area.
25-inch "	{ 5,859 quarter "	
5-feet "	47,019*	Extend over certain town areas.
10-feet "	1,355†	
	10,107‡	

The following is the number for Scotland:

1-inch scale	-	132 sheets	These extend over the whole country.
6-inch "	-	2,041 "	
25-inch "	(cultivated districts)	about	- - - 14,500* sheets.
5 feet scale	-	-	- 147† "
10 feet "	-	-	- 892‡ "

The following is the number for Ireland:

1-inch scale	-	205 sheets	These extend over the whole country.
6-inch "	-	1,907 "	
25-inch "	-	-	- 23,000† sheets.
5 feet "	-	-	- 422† "
10 feet "	-	-	- 937‡ "

It will be noticed how greatly the number of sheets or publications increases with the increase of scale of the map or plan; so that whilst 956 sheets of the 1-inch map cover the whole area of the United Kingdom (123,083 square miles), 13,860 sheets of much larger size are required for the towns only covering an area of 958 square miles, or less than the area contained in four 1-inch sheets. A single 1-inch sheet embraces the same area of country as 3,600 town sheets on the 10·56-foot scale.

d.—REVISION OF TOWN MAPS.

One of the most important points connected with revision is the consideration of the time and cost which the revision of the town plans involves. Alterations in and round towns are very numerous. Towns extend, and the area of the town plans has also to be extended. Moreover, the alterations in town plans, due to the extreme minuteness of the detail shown, are often so great as to entail re-survey. It may be a question whether it was wise to have given to the towns a map on the 10·56-foot scale, an operation the magnitude of which seems hardly to have been realised at the time when it was decided on. Not only do the plans, as stated above, quickly become obsolete, but, owing to the rapid growth of towns, the number of town plans is constantly increasing.

The evidence of the Director-General shows (see Appendix VII.) that on the 30th June 1892 615,546 acres, or 956 square miles (about 14,000 plans), had been published on one or other of the town scales, and that a large additional area is probably, according to present instructions, entitled to be surveyed on a town scale. It also

* A considerable number of these are not yet published.

† These are the numbers published on 14th April 1892. The number of these town plans has increased considerably since that date, and will increase still more.

‡ Only a small number of these have as yet been published.

shows that the cost of the actual survey, apart from the cost of publication, for the 10·56-foot scale is about five times the cost of the survey for the 25·344-inch scale, for equal areas of similar density of population, owing to the closer triangulation, the minuter accuracy required, the larger amount of detail shown, and the more numerous levels. Moreover, for equal areas the cost of publication, apart from survey, of the 10·56-foot scale is on an average more than ten times as great (the exact proportion varying with the process adopted) as that of publication on the 25·344-inch scale.

We consider that the advantage to the municipal authorities in the possession of such a map as that on the 10-foot scale is very great, but we do not think that there is a corresponding advantage to the Government and to the general public; we also consider that the 25·344-inch scale maps, if kept up to date, meet every requirement from the ordinary public point of view.

So much is this the case that for Edinburgh two private publishers each publish annually corrected editions on the 6-inch scale, founded on the Ordnance Survey, of several thousand copies, and one of these publishers has also a map of Edinburgh on a 15-inch scale, portions of which are occasionally revised to date and reprinted, and these maps are very commonly used both for satisfying the ordinary requirements of a town map and for public purposes in laying out in a preliminary manner municipal works. Nearly similar remarks will apply to Glasgow, where a 12-inch engraved map, correct to date, is now being prepared for the municipality. These private publishers' maps displace the Ordnance maps on the 6-inch and 25-inch scales and, to some extent, the 5-foot map, because they are up to date.

The sale of the 5-foot and 10-foot maps is very small. A return of sales in respect of 14 towns possessing 1,201 sheets of these large maps during a period ranging from 1866 to 1887 showed a sale of only 12 complete maps for each town, or an average of 12 copies sold of every sheet published. A return made out for a previous Departmental Committee shows that the net annual sum received by the Government for the sale of town maps has for the period between 1886 and 1891 averaged only 2s. 3d. per plan. (See Appendix XVIII.) The average cost of the survey is 40l. per plan. The average cost of publication and preparation for publication is 5l. per plan.

Not the least of the difficulties connected with the town surveys is that of publication. There are 13,860 original plans, of which on an average, as shown above, little more than one copy is sold per annum, and the whole of the published copies of which, in order to be thoroughly useful, should receive some sort of revision every year. It should be possible to show at all times upon such a map, if specially asked for, every alteration which has been in existence for more than 12 months, a condition which is hardly compatible with the production of printed copies of a map. Although printed copies would be much cheaper to the purchaser than manuscript ones, they fail to answer the intended purpose of being correct to date, which is the main object of very large scale maps. Publication under these circumstances becomes, in our opinion, an unnecessary burthen and a waste of money both as regards the printing and storage of copies.

The following extract from Sir Charles Trevelyan's Treasury Minute of the 19th October 1854, is given as bearing upon this point:—

"As regards the plans of towns, it is deserving of serious consideration whether sufficient reasons exist for engraving any detailed plan. All the substantial public uses to be derived from such plans will be obtained from one or two copies of the 1/500 scale drawn upon paper, and if the multiplication of copies by engraving is called for, the demand is not likely to be for copies on a large scale, but for street maps such as are published in guide books and Post Office Directories, the preparation of which is usually left to private publishers. At any rate there does not appear to be any urgent demand for engraving detailed maps of towns, and the decision of the question may therefore be postponed until it can be entered upon with the advantage of more full information."

We are informed by the Director-General that, unless some steps are taken to relieve the Ordnance Survey of some of this town work which is constantly growing, it will be necessary either to increase the buildings and plant at Southampton, or to have some of the work done by contract, if the revisions of the 1-inch and 25-inch maps in 4 and 10 years respectively, which we have recommended, be carried out (see pages x and xi). With regard to the possibility of obtaining extraneous assistance of this kind for the Survey we desire to state that at our request tenders for publishing a selected plan were invited from six firms, and from the replies received we are satisfied that, if necessary, the Ordnance Survey Department may properly be directed to obtain such assistance from the trade.

Many town surveyors now keep up their copy of the town map by constant correction. Where this is not done the map becomes rapidly useless for the purposes of the town authority. The published map when more than a very few years old,

and in many cases it is now over 25 years old, is also unreliable for the purposes for which the general public require it. Every town authority, however, possesses, under the operation of its byelaws, information as to and plans of all alterations made within its boundaries.

Having regard to all these facts, we consider that a change should be made in the procedure in respect to the town map on the 10 or 5-foot scales, which shall have the effect of relieving the Ordnance Survey Department of the survey and revision, and likewise of the publication of the town-scale maps, and which, while leaving it the duty of supervising the maintenance of the maps, shall permit that Department to devote itself more thoroughly to the general maps. Such a change would also relieve the national exchequer of the burthen of an expenditure for thoroughly local purposes.

It should be noticed that, even after the change which we are recommending is effected every town will possess, in the national map on the 25-inch scale, an excellent town map, on a much larger scale than that which, as already noticed, the Edinburgh publishers publish and sell in considerable numbers. This map is in practice found to be large enough for most town purposes, and as a key map is sufficient for the identification of particular parcels of town lands and houses offered for sale.

In order to carry out the proposal to relieve the Ordnance Survey and the public of the charge and cost of maintaining the town plans, and at the same time to ensure their maintenance in future, we recommend :—

(1.) That every town authority, now possessing or hereafter becoming possessed of a map executed by the Ordnance Survey on a town scale, should be placed under a statuteable obligation to maintain and correct a copy of that map showing all alterations in the town inserted in accordance with instructions and regulations to be issued by the Ordnance Survey Department with the approval of the Minister in whose department the control of the Ordnance Survey is vested.

(2.) That the revision of this map should from time to time be locally inspected and supervised by officers of the Ordnance Survey at the cost of the State, in order that its proper maintenance may be secured, the necessary cost of the examiners employed in testing the work being defrayed by the town.

(3.) Failing such proper maintenance the Ordnance surveyors would do what is found to be necessary, and charge the cost to the town, the time and method of making these examinations to be left to the arrangement of the Survey Department.

(4.) Within a period of not more than five years this map should be sent to the Survey Department, and from it a new or revised copy should be made, if necessary, at the expense of the Department. This copy would be retained by the Department, and from it another copy should be supplied to the town or to any person desiring a copy at cost price.

(5.) Should the town wish to have an edition printed from this revised map, it should have liberty to carry out the printing, publication, and issue thereof, or should it wish the Ordnance Survey Department to undertake the work, that Department should do so at the expense of the town, provided that, in the opinion of the Minister in charge of the Ordnance Survey, this duty can be performed without unduly interfering with the regular work of the Department. In the event of the town publishing its own maps steps should be taken by the Ordnance Survey Department to keep the public duly informed where these can be purchased.

(6.) The Ordnance Survey should be always at liberty to print and publish an edition of any town map should such an edition, in the opinion of the Minister in charge, be required in the interests of the public.

When such an arrangement comes into force the Ordnance Survey Department should hand over without payment all the existing stock of town maps to the respective town authorities for storage and sale by them at such prices as each authority may determine, only retaining sufficient copies for the use of the Department and not for sale. Future published editions, if any, being paid for by the towns at the cost price, would equally be at the disposal of the respective towns for sale.

By such a method as this the great outlay already incurred in preparing the cadastral plans of towns would not be lost. Each town would at all times be provided with a perfectly accurate map in consideration of which it may perfectly well bear the cost of revision and maintenance, while the continued accuracy of the map would be secured by the supervision and control of the Ordnance Survey Department.

In the event of the town desiring publication or complete revision, either of the whole map or of certain sheets of the map, oftener than once in five years there need be no objection to such being provided for it on the above-mentioned terms.

Extensions of existing town maps and the creation of new ones should only be carried out on the conditions stated below. It has been shown to us that there are serious difficulties in the way of towns producing for themselves such extension of their plans by private survey as will suffice for their purposes, whilst the Ordnance Survey possess the means of doing so with the same accuracy as the original survey. We therefore make the following additional recommendations.

(7.) The Ordnance Survey, if called on by the town authorities to do so, should supply to them, at the cost of the State, a first triangulation of the area outside their existing map of which they require a map on the town scale. This triangulation would comprise only points determined in the usual manner, and in sufficiently close proximity to form a basis for subsequent survey on the town scale. The work would be laid down on sheets corresponding to those of the town map of the Ordnance Survey.

(8.) Should the town authorities further desire it, the Ordnance Survey should lay down, at the cost of the town, as much of the detail, roads, fences, &c. as might be required.

(9.) Should the town authorities wish that a complete map of an area newly built over should be made by the Ordnance Survey, this should be done at the cost of the town, at as early a date as the Department can arrange for.

(10.) The same facilities should be available for towns which do not now possess a town map.

(11.) Such extensions of maps or new maps would come under the same rules as to maintenance and revision as already stated for maps now in existence.

Before leaving the subject of these proposals it may be remarked that in the event of the introduction of a general system of land registration the town plans would possess great local importance. Several hundred copies of each sheet might be sold in a short time, and their publication under the above arrangements might become a source of profit to the town authorities.

Should these proposals be adopted, they should be brought into operation as soon as the necessary arrangements can be made, with due consideration for work now in progress. It might be desirable to apply the proposals as to publication at an earlier date than those as to survey.

In the event of the above proposals as to town maps not being adopted, we think it desirable to point out that difficulties have arisen from there being at present no definition of what is a town, or how thickly populated an area should be in order to entitle it to the advantage of a 10·56-foot scale survey. We recommend that no area be surveyed for the town scale at the public expense which is not closely built over, and that there should be no obligation on the Ordnance Survey Department to extend the survey on a town scale to the boundary of parishes, municipal areas, or to districts mainly covered by detached villas.

e.—GENERAL REMARKS ON REVISION.

There is another point connected with revision to which we think it advisable to allude. At present the Ordnance Survey endeavour to show on the plans altered county, parish, municipal, and other administrative boundaries as soon as possible after any alteration has been confirmed. It appears to us that the advantages of doing so are not sufficient to compensate for the labour and expense entailed in re-publication and the cancelling of old plans during the interval between the regular periodical revisions. In view of the fact that an altered boundary will often affect a large number of plans, and that the alteration will entail either new editions of these plans or the alteration by hand of all impressions in store, as well as necessitating alterations on the smaller scale maps and in the index maps affected, we recommend that alterations to boundaries be not inserted on Ordnance Survey plans until the regular revision of the district is taken up, but that the altered boundaries which are now shown on Ordnance maps supplied to the Survey under legal obligation by the local authorities concerned, should in the first instance be correctly ascertained and delineated on the maps by the Survey, and that the cost of ascertaining them should be part of the cost incurred by the locality seeking such alteration, and that the Survey during the intermediate period between revisions should be under an obligation to insert specially by hand the new boundary so ascertained on any copy on receiving an application to that effect, the applicant paying the expense of such insertion. Upon the next general revision or upon any newly dated publication of a map the altered boundary would be shown along with all the other new features.

With a view to facilitating the general revision of the Ordnance Survey on all scales, we recommend that the constructors of new railways, canals, docks, or other engineering works altering the face of the country, likewise mining engineers, be required by statute to insert the completed works on Ordnance maps of such a scale as may be considered necessary by the Survey, and to forward such copies to the Ordnance Survey at Southampton. We further recommend that county surveyors, surveyors of local boards, boroughs, &c. (other than the authorities of towns possessing a town map, whose case has already been dealt with), be required to send similar information, either on a map itself, or on a tracing from an Ordnance map, with regard to new roads or streets and alterations to existing roads and streets.

In the case of county and borough and local board surveyors this obligation would be imposed on the authorities, in whose service such surveyors are.

As comparisons have been instituted between the maps of the Ordnance Survey and those of foreign Governments it may be useful here to state what is the nature and present condition of the cadastral survey of France, to what extent it forms a national map, and what is now being proposed to be done in respect of it. Such a statement will be found to have a considerable bearing on the subject of revision.

Our information is derived from the official record of a French Government Commission which was appointed last year to inquire into the whole matter. M. Rouvier, Finance Minister, in addressing a request to the President of the Republic, under date 29th May 1891, that such a commission of inquiry might be instituted, stated that the Government was of opinion that an accurate triangulation should precede the renewal of operations on the cadastral map, and that Parliament had granted a credit of 1,000,000 francs in order to allow the necessary consideration and study to be given to the subject, and the requisite experience to be gained before a reform so considerable as the renewal of the cadastral map should be begun.

The Commission granted upon this request was a large one, and included Admiral Mouchez, Director of the Observatory of Paris, M. Janssen, the astronomer, many eminent senators and lawyers, the Minister of Agriculture, the Director of the Inland Revenue, the Chief of the Geographical Department of the Army, and many other distinguished personages.

The Commission divided itself into three sub-commissions, viz., one on the technical subjects, one on the legal aspects, and the third on the financial question as to how the cost should be distributed between the State and local bodies. M. Tirard, Senator of France, was named President of the Technical Sub-Commission, from whose report we will make a few quotations.

At the second sitting M. Boutin, Chief of the Department of Direct Taxes, stated:—

That the cadastre, which was begun in 1808 and finished in 1846, was, as regards its most modern portions, 45 years old, and therefore in a very bad state; almost everywhere the map was no longer in harmony with the actual divisions of the land.

M. Terrier, deputy, tells the Commission:—

That it is necessary to recognise that at the present time the old cadastre is useless, and that it is indispensable to renew it.

M. Debray, Engineer des Ponts et Chaussées, says:—

That the cadastral plan is not free from grave errors, and that on the plans of the Commune of Alfortville, which they had just inspected, they had discovered errors of 7 mètres in a length of 300 mètres; and that an employé of his who had bought two contiguous parcels of land and built a house which stood partially on both of them, found that, notwithstanding this actual proximity, on the cadastral list these two parcels were represented as being 300 mètres apart. This and similar experiences, he states, prove that it is absolutely necessary to reconstruct the cadastre.

Col. Laussedat, Director of the Conservatoire national des Arts et Métiers, asserts that:—

In making the new cadastral survey, in order to give to this great operation the degree of precision it should have, we ought to join it to the triangulation of France.

He also complains that:—

While they are behind other countries in their cadastral plans, they are also behindhand in their maps: for whilst England, Belgium, and Germany have large-scale maps on the 1/50,000, the 1/20,000, and the 1/10,000 scale with contours, they have nothing better than their beautiful staff map on the 1/80,000 scale, which instead of contours has only vertical hachures.

A discussion having arisen on the probable cost of the work of remaking the cadastre, a report and estimate was presented by M. Celler, Chief Engineer of the Eastern Railway of France, and it apparently was accepted as a reliable document.

It states that—

“The operations which are necessary for the restoration or making of the cadastre, strictly so called, that is to say, dispensing with the previous determination of the legal boundaries of properties, may be divided into

two portions, the first the geometrical portion, the second that relating to the valuation of the property and the equal distribution of the taxes over the land." p. 77.

"The first part comprises the triangulation, the survey and drawing of the plans, the checking of the parcels, the checking of the plans of groups of parcels, the calculation of areas both for parcels and for groups, the insertion of notices to indicate the ownership of properties, and the verification of all these operations."

"The expense of doing this may be taken at two francs per hectare and one franc per parcel."

"On the assumption that each hectare will contain three parcels, the cost will be $1f. \times 3 = 3f. + 2f. = 5f.$, 5 francs $\times$ 53,000,000 hectares, which is the superficies of France = 265,000,000 francs," or about £10,600,000.

It will thus be seen, as is mentioned by Sir C. Wilson in his evidence, that we in England have taken in hand and nearly completed as a national work a class of map which has not been attempted by the State as a central authority in France, namely, the creation of an accurate large-scale map, from which a general topographical map is reduced, thus ensuring an absolutely accurate map of the whole country. The cadastral maps existing in France are local maps corresponding nearly in status to our parochial tithe maps.

III.—THIRD HEAD OF REFERENCE.

Whether the maps, as at present issued, satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed, and price, and whether any improvement can be made in the catalogue and indexes?

Under present instructions the Ordnance Survey is authorized to produce:—

- (1.) Maps or plans of towns of over 4,000 inhabitants on a scale of 1/500 (10·56 feet to a mile). A few towns have been published on a scale of 1/528 (10 feet to a mile) and a considerable number on a scale of 1/1,056 (5 feet to a mile).
- (2.) A map on the 1/2,500 scale (25·344 inches to a mile) of all cultivated districts.
- (3.) A general map on the scale of 6 inches to a mile (1/10,560).
- (4.) A general map on a scale of 1 inch to a mile (1/63,360).
- (5.) A map on the scale of 4 miles to an inch (1/253,440).
- (6.) A map on the scale of 10 miles to an inch (1/633,600).

We have already stated the progress made in the first four of these maps.

As to (5) a map of England on the scale of 4 miles to an inch based on the old 1-inch map has been published, but in an incomplete state. It is intended to revise it as soon as the new series of 1-inch sheets is completed, and also to publish it with hill-shading.

An advance edition of a similar map of Scotland has been published by photolithography. This map will be eventually engraved.

The corresponding map of Ireland has been published engraved in outline, and the engraving of the hills is in progress.

The map on a scale of 10 miles to an inch (No. 6) has only been partly completed, but has been largely used as an index map, and also by the military departments. When the revision of the 1-inch map has been completed this map will also be revised and published.

Criticisms of the work of the Ordnance Survey have appeared in the public press, and have been made by some witnesses before this Committee, and certain of the small-scale maps of the Ordnance Survey have been compared unfavourably with those of foreign countries. The Committee think that it will be convenient to deal with these criticisms before considering in detail the various defects alleged and the suggestions made before them.

The criticisms on the general quality of the Ordnance Survey maps may be divided into:—

- (a.) Those on the large-scale maps.
- (b.) Those on the 1-inch maps.
- (c.) Those on the 4-mile map.

We will take them in order and afterwards add (d) observations on accuracy generally and comparison with certain foreign surveys.

a.—General Criticisms on the Large-Scale Maps.

As regards the large-scale maps a number of errors were mentioned. On investigation it was found that the principal of these were mainly errors arising from want of revision, a subject already dealt with under the second head of reference. It is obviously impossible that a map should exhibit details which did not exist when it

was published. The public, not unnaturally, expects that a map published with Government authority shall accurately represent existing facts, but the entire want of revision subsequent to survey has prevented this expectation from being realised, and hence has arisen a very general expression of dissatisfaction.

All the witnesses admitted the general accuracy of the Ordnance Survey work. We have carefully examined the instances of errors alleged, and find that while the greater part of them are due, as just stated, to want of revision, the remainder are chiefly matters of opinion,—very few being original errors in the work.

b.—General Criticisms on the One-Inch Map.

As regards the 1-inch map, the criticisms refer mainly to points which will be dealt with in detail in p. xxii *et seq.* In so far as errors have been alleged the remarks made by the Committee on the large-scale maps, para. (a), will apply.

We consider that as regards general design and execution the new series of 1-inch map satisfies the conditions required from a map on that scale. It is excellent in the quality of its engraving, is as good in that respect as the old 1-inch map, and in regard to the portions for which the hill-shading is completed is, in our opinion, equal, if not superior, to the Dufour Swiss map, referred to on p. xxii. Its general accuracy, except from causes arising from want of revision, is indisputable.

In the course of our investigation various improvements have occurred to us, some of which being of a general character, we will here specify, leaving the others to be mentioned under the detailed criticisms in a later part of the Report.

In some sheets of this map, in the mountainous districts, the representation of the hills has not been wholly successful, the shading being so dark as to obscure the lettering of the map and other details, such as roads, &c. This defect which has doubtless arisen from the shading having been carried from the lower grounds, which were first published, to the higher grounds which have more recently been surveyed, seems to be almost inseparable from the attempt to preserve a due gradation of shade if the map is printed in black only. If the present method of hill-shading is continued it might be desirable to print the hill-shading in brown or some other approved colour, so as to leave the names, streams, and other topographical features clearly expressed in black. As the hills have recently been engraved on a separate plate, there would be no difficulty in carrying out this suggestion in the case of the more recent sheets. Experimental sheets which we have seen are very satisfactory. It has also been shown to us that the old plates can be duplicated so as to give a separate hill plate, and the results, which we have examined, leave nothing to be desired. We think that this duplication should be undertaken as soon as practicable, so as to enable the entire 1-inch hill-shaded map to be produced in black with hills in colour, should that course be decided upon.

The whole of this subject of hill-shading has had much attention from the Committee. It is obvious that if any partial change were made in the method of production, the hill-shaded maps of England and Scotland, if mounted together, would not match or join properly, and the same difficulty would occur in England in respect of the already finished hill sheets and the new ones, unless those now finished were set aside. Engraving, although undoubtedly the best method, is slow and costly. The present map of England will not be completed with hills by this process before 1910. Scotland and Ireland will be completed by 1893 and 1894 respectively. Of England and Wales, out of 360 sheets 98 are either completed or in progress, but some of them in the north of England are imperfect owing to wear. In view of these facts arrangements have been made to produce by photo-zincography, and publish by the year 1900, an advanced edition with hills of all portions of the country which would not then have been completed in the engraved form. An old specimen of this process shown to us proves that photo-zincography can be made to yield satisfactory results, and we consider that specimens recently submitted to us are sufficiently good for an advanced edition which is of a temporary character.

In considering the question whether the hill-shading should be continued by engraving, the additional cost involved in the production of the advanced edition by photo-zincography has to be taken into account. Evidence was laid before the Committee, upon the authority of Field-Marshal Baron Kuhn, of the Austrian Army, and of the late Dr. Peterman, of Gotha, regarding the process known as heliogravure. It was asserted that this process will produce plates approximating in quality to those obtained by engraving, and that our hill-shaded sheets in the present style could be produced by this method. An Austrian Government map, issued by the Imperial

Military Geographical Institute of Vienna, and reproduced by this process in a publication by Justus Perthes of Gotha in 1878, was examined by us. We found it to be certainly of excellent quality; this map, however, is very superior to the general character of the maps issued by the Austrian Government which we have had before us, and which are those ordinarily on sale. From figures showing the speed and cost of the process, it appears to be at once cheaper and more expeditious than engraving. The Austrian map on the scale 1/75,000 was produced by heliogravure. The training of draughtsmen began in 1872, the drawing of the map in the second half of 1873, and by the end of 1877 some 271 sheets had been published. If this precedent be taken it would seem that the 1-inch hill-shaded map of England and Wales could be completed by the close of 1897 or 1898 according to the date when the training of the draughtsmen would begin.

We have it on Sir C. Wilson's evidence that, if we had to start afresh, the process of heliogravure, although inferior to engraving, would be good enough to be adopted. His department thoroughly understands the nature of the process, although they have not worked it. Bearing all this in mind, we recommend that the Department be instructed to institute such an exhaustive inquiry, coupled with experiments into the practice of heliogravure as will enable them effectually to test its adaptability to our requirements. If they can produce such results as would enable them to substitute hill plates by heliogravure for hill plates by engraving without serious deterioration of effect (as, judging from the above-mentioned Austrian sheet, we think might be possible), this process might be definitely adopted for so much of the hill-shading work as might at that time be uncompleted. We would, however, add that no less degree of excellence than is attained in this particular Austrian map would be satisfactory.

We have also had under consideration a proposal to distinguish contour lines by colour from the other geographical details of the 1-inch map. At present these lines are apt, without careful reading of the map, to be taken as representing boundaries or footpaths. To print them in colour, however, would involve a second printing, and this could not be carried out with the absolute accuracy which a single printing ensures.

We are therefore distinctly of opinion that as it is important that the present 1-inch map should be maintained in as perfectly accurate a form as possible, no change in the black edition should be made as regards contours, especially since their existing want of distinctiveness would, we think, be in large part removed by the omission of parish boundaries, which we have recommended at page xxxiii. The demand or desire, however, for coloured contours should be met by the 1-inch military map referred to on pages xxix and xxx for which such strict accuracy is not required.

c.—General Criticisms on the Four-Mile-to-the-Inch Map.

The 4-mile map recently published has also been criticised, both in the press and by some of the witnesses before this Committee. The circumstances under which this map was produced are explained in the Director-General's evidence (Q. 669-691), and in Appendices III. and IV.

This map, necessarily based on the 1-inch map, cannot be issued in a perfect form until the new 1-inch map has been entirely completed. It must obviously share the faults of the parent map, which was in great part the old series 1-inch. In 1872 when the production of a new 1-inch map for the South of England was authorised, the engraving of the 4-mile map, then well advanced, was discontinued. In 1884 the Director-General of the Geological Survey, having pointed out that the map would, even in its state at that time, be a useful map for his department, asked that it might be completed. The map was therefore completed at the cost of the Geological Survey, but was not published. As the map was in an avowedly imperfect state, it was not considered desirable to attempt any revision, except of railways, before issuing it to the Geological Survey, and some errors are due to that cause.

Subsequently Mr. Stanford, the selling agent for Ordnance maps, having asked for transfers of several portions with a view to reproducing them, and the map having been found useful for Departmental purposes, the Director-General considered that even in its present imperfect state it would meet a public want. It was, therefore, issued with a note on it to the effect that it was reproduced from the old 1-inch map. Notwithstanding this note, the admittedly imperfect state of the map does not appear to have been clearly realised by the public. To guard against any continuance of this misconception we recommend that its real character should be unmistakably

indicated on each sheet sold in future. It has been suggested that it should be wholly withdrawn from circulation until it can be issued in a perfect state, but as it appears from its sale to be of considerable use to the public, we do not recommend this course. As soon as the data are available this map can be perfected without difficulty, and it is intended that this should be done from the new 1-inch map when completed.

We are of opinion that the engraving of the map is excellent, and that it is likely to be a useful map both for educational and strategical purposes, and we recommend that it should be corrected and completed with hills as soon as the 1-inch map is out of hand. With regard to the contours it should be considered whether they can be inserted with advantage on a map of this scale, and whether one of the rapid processes for the production of hills cannot be adopted. This recommendation as to contours and hills applies equally to the similar map of Scotland, of which an advanced edition has been completed by photo-zincography. It is proposed to engrave this map also in outline and with hills. The outline map of Ireland has been completely engraved, and an edition with hills is in progress.

d.—Accuracy generally and Comparison with Foreign Surveys.

It seems fitting that we should here give extracts from the evidence of some very competent witnesses as to the general accuracy of the work of the Ordnance Survey.

Sir A. Geikie, the Director-General of the Geological Survey of Great Britain and Ireland, says (Q. 3007):—

“The Geological Survey work is based on the maps of the Ordnance Survey, and I suppose that these maps have never been put to a severer test than they have been by the detailed work of the Geological Survey.”

“The general excellence of the Ordnance Survey maps is a constant subject of remark.”

And again (Q. 3023):—

“I have spoken of the great excellence of the Ordnance maps. We have tested them everywhere all over the three kingdoms and we can speak with some confidence as to the extreme accuracy and beauty of the maps. I can hardly conceive of a survey more technically accurate than ours. Of course we have found mistakes in the map, but they are comparatively few. I think I could almost reckon on the fingers of one hand all the mistakes I have personally come across after many years of work in the field.”

Sir G. Leach, whose employment for many years as Assistant Commissioner of the Copyhold Enclosure and Tithe Commission, in charge of the Survey Department of the Commission, and subsequently as Commissioner in the same Department, has given him almost unrivalled opportunities of judging of the accuracy of the Ordnance Survey map, says (Q. 4047):—

“I should have no hesitation whatever in saying that, so far as anything can be accurate, the Ordnance Survey maps are accurate, and that the number of errors is infinitesimally small.”

General J. T. Walker, C.B., F.R.S., late Surveyor-General for India, says (Q. 5377):—

“I think the maps of the Ordnance Survey compare very well with and are generally much superior to those of the Indian Government, or of any Foreign Government, and as regards accuracy of topographical delineation, no method of operation can produce better results than that of the Ordnance Survey.”

Sir John Ball Greene, late Commissioner of Valuation and Boundary Surveyor in Ireland, and his successor, Mr. J. G. Barton, state that the Irish Ordnance Survey maps:—

“In the counties which have been revised, are faultless in detail and in characteristic, and their accuracy is universally acknowledged.”

Mr. Crook, C.E., who has paid great attention to the Ordnance Survey maps, and has been one of their severest critics in the press as regards want of revision, and certain faults in publication and execution, says, in answer to a question (Q. 1092) whether he had often found mistakes in the Ordnance Survey:—

“With the large cadastral plan and the 6-inch maps very seldom indeed. I think the errors in these large-scale maps are not more than would be due to human fallibility in all things.” And (Q. 809), “I think as regards these hill-shaded maps of Scotland, so far as the hill features are concerned, there is nothing like them in the world.”

Mr. E. Cooper, who as the engineer of the Lancashire, Derbyshire, and East Coast Railway, has lately laid out the longest railway ever sanctioned, says (Q. 3537):—

“We trust to that (the 6-inch map) absolutely before going on to the ground. Our experience of the 6-inch Ordnance map is that it is so absolutely correct that you are perfectly certain of arriving on the ground at the result you have come to on the map, so far as actual facts are concerned.”

And (Q. 3541), in answer to the question:—

“But I understand you to say, speaking of the accuracy of the Ordnance Survey, that when you have tested it by the practical survey by which you actually construct your line, you have found it very near indeed.”

He says:—

“So near that we may call it perfect.”

Speaking of the 25-inch plans, he says (Q. 3629) :—

"I consider their correctness is wonderful." Q. 3690. "There is no map published which can in any way compare with our 6-inch, so far as my knowledge goes, anywhere in the world." Q. 3691. "I consider that our 1-inch is superior to any similar scale of map I have seen."

Mr. E. G. Wheler, commissioner to the Duke of Northumberland, who has largely used the Ordnance Survey maps in connexion with the extensive alterations which have gone on in late years in different portions of the Duke's property, says, with regard to the 25-inch map (Q. 2081) :—

"I find it is accurate, very accurate, as a survey, but of course it needs much alteration, especially in "populous places." Q. 2180. "Land can be bought and sold on the 25-inch survey."

Mr. Andrew Murray, city surveyor to the Corporation of London, when asked (Q. 3117) :—

"Is the 5-foot scale map accurate as a map?" answers "Yes, I do not think I have ever found a mistake in it in our department. I have used it very largely chiefly for estate purposes."

Mr. W. S. Till, city surveyor of Birmingham, says (Q. 3237) :—

"The 1/500 (10·56 feet) map of Birmingham 'is a very good map indeed.'"

Mr. G. H. Leane, civil engineer and surveyor, who has had great experience in Ordnance plans, says (Q. 3741) :—

"I have found the maps generally very accurate;" and (Q. 3795-6-7), "am quite satisfied with the "outline 1-inch map, and consider it a beautiful map."

The Ordnance Survey Department are, as far as we can judge, ready and willing recipients of any information from the public as to errors or supposed errors that they may have detected in any portion of the Survey work.

As in the criticisms which have appeared in the public press upon the publications of the Ordnance Survey disparaging comparisons have been made between these and the maps of foreign countries, we have considered it to be our duty to investigate this subject with the greatest attention. We have already stated in this Report the general result of this investigation, and we deem it proper to insert here a foreign criticism of the Ordnance Survey by one of the most competent authorities on the Continent. We should state, however, that no proper comparison can be made between the large-scale maps of the Ordnance Survey and those of foreign countries, because no foreign country publishes a general map on so large a scale as even the 6-inch scale. Appendix VI. shows that many States do not publish on even a 2-inch scale. No foreign country publishes, unless in exceptional cases, its cadastral survey, nor issues plans of its towns on scales like those of the Ordnance Survey.

The foreign criticism which we proceed to quote is that of an eminent Frenchman, Gen. Derrécagaix, Director of the Geographical Department in France, who, in a report on the maps exhibited at the International Congress of Geographical Science held at Paris in 1889, stated—

"That the productions of the Ordnance Survey have for a long time been quoted as a work without precedent, and which should serve as a model for all civilised nations, and that this eulogium is in a great measure deserved, but that there are some drawbacks to it."

We give the following abstracts of his further remarks :—

That its scales are irregular, viz., not decimally in accord with one another, as foreign maps invariably are.

As regards the 6-inch maps, he speaks of—

The beauty of the original engraved ones, and of the length of time to which engraving would have prolonged the publication, whilst the present process of photo-zincography now produces extremely readable results, and is very rapid.

He then points out the difficulties arising from want of revision.

He next remarks on the excessive use of dots :—

Too much is indicated on the maps by dotted lines; there are too many distinctions of roads, amounting to six in all, and when an unfenced road (dotted) passes through a marshy plain (also dotted), and is the boundary of a parish (also dotted), and if this is bordered by a contour line (also dotted), this series of dots becomes so puzzling to the eye that it is difficult to understand what is meant in spite of the perfection of the work.

The woods are very well executed, even representing the character of the trees, but the undergrowth, mingling with the hachures, causes them a little to resemble débris of rocks.

The hedges and the isolated trees give a very pretty effect.

The 6-inch map has an immense affluence of boundary symbols. The draughtsmen have succeeded well in rendering the lettering readable.

Every ruined structure is marked in Gothic letters of different character according as the ruins are Druidic, Roman, Saxon, or Norman.

An excellent innovation has been made which has been well received by the public, viz., the insertion on the large scales of the areas; in consequence there is no necessity to refer to the area book.

In the representation of hill-shading the engravers have not kept to a regular scale. The new series is very superior to the old; nevertheless, although the hachures are effectively engraved, they do not altogether satisfy modern requirements, they are too scratchy and somehow want expression, and the figured levels, except those on the roads, are too few.

To sum up, the question of revision is always pressing, and that alone threatens entirely to destroy the fruit of so much labour. One may say, without disparaging Great Britain, that her cartography has a local character, preserving its peculiar merits which are certainly indisputable.

We have had laid before us, and have carefully examined, specimens of the maps of the following countries: Austria, Belgium, Denmark, France and Algeria, Germany, Italy, Japan, Java, Netherlands, Norway, Russia, Servia, Spain, Sweden, Switzerland, and the United States. Many of these possess special features deserving of much commendation, some of them such as we might desire to adopt ourselves if we were commencing a new work, but taking our 1-inch map as a whole and making allowances for want of revision, we consider that there is certainly no map which excels it in the combination of accuracy, beauty, and clearness. Much has been said about its deficiency owing to the want of colour-printing. However advantageous colour may be in special maps it is out of place, we consider, in the mother map. Austria, Switzerland, France, and Germany do not print their original map otherwise than in black and white, although they may, and sometimes do, produce other editions with colour added. The French *carte vicinale* on the 1/100,000 scale (nearly $\frac{2}{3}$ -inch to a mile) is a specimen of this combination. It is a reduction from the French staff or army map and is made by direction of the Minister of the Interior by contract with a private map publisher, and not by the Survey Department of France. It is a clear and pretty map, well adapted for popular use. If Parliament should so direct there would be no difficulty in getting a similar map produced by contract with one of our map publishers, its basis being our 1-inch map.

The Dufour map of Switzerland is probably the most beautifully designed and engraved map to be found on the continent. The Norwegian map is also a good specimen of a useful map. It is printed from stone, the hill forms being shown with very considerable effect by horizontal sketched contours based on a considerable number of levels, aided by tinting and stumping. In this manner a very effective hill-shaded map is produced at a small cost. It varies, however, greatly in the colouring of different sheets. The Austrian map has the merit of having been very rapidly produced, but its style of execution cannot be taken as a satisfactory model for our 1-inch map. The German maps, now being published, are excellent in quality. The Algerian maps lately produced by the French Government showing the hills by horizontal contours and stumping, have special points of excellence and are very attractive. In respect of systems of hill-shading, it is probable that the last word has not yet been spoken, but at present for large areas of map-drawing vertical hachuring claims the pre-eminence and is adopted for the standard maps of many countries, including France, Germany, Austria, and Switzerland, and, in great part, Italy. The general execution of some of the foreign maps may well be taken into consideration should the recommendation of combination and coloured maps be adopted, to which reference is made in a later part of this Report, see pp. xxix and xxx.

COMPLAINTS AND SUGGESTIONS.

The principal complaints and suggestions brought to the notice of the Committee regarding the Ordnance Survey maps are as follows:—

- (1.) Want of revision.
- (2.) Want of uniformity in style and paper.
- (3.) Insufficiency of contours.
- (4.) Desirability of introducing heliogravure or some more rapid method of hill-shading.
- (5.) Inconvenience of the numerous meridians on which the maps are drawn.
- (6.) Inconvenience of the indexes and difficulty in understanding them.
- (7.) Difficulty in mounting maps owing to shrinkage of paper.
- (8.) It has been suggested that colour-printed maps should be published.
- (9.) That combined sheets of the country round towns should be published both on the 6-inch and 1-inch scales.
- (10.) That the classification of roads is bad.
- (11.) That the expense of coloured impressions of the large scale maps is too high.
- (12.) That hedgerow timber, single trees, and paths in gardens should be omitted.
- (13.) It has been objected that the Ordnance Survey maps do not show property boundaries.
- (14.) It has been further objected that footpaths are shown on the Ordnance Survey plans which do not exist.
- (15.) It has been suggested that conventional signs should be printed on the margins of the maps.

- (16.) That area numbers be given up, or that the numbering be by sheets instead of parishes.
- (17.) That all boundaries, except county boundaries, be taken off the 1-inch map.
- (18.) That maps on certain additional scales be published.
- (19.) That the depths of lakes, and some indication of the depths round the coast, be shown on Ordnance Survey maps.
- (20.) That an edition of the 1-inch map and of maps on a larger scale on thin tough paper be issued.
- (21.) That a cheap edition of the 1-inch map be produced.
- (22.) That the maps are too expensive.
- (23.) The question has been raised whether boundaries should be revised as soon as altered, or whether they should await general revision.
- (24.) Stress has been laid on the inaccuracy and insufficiency of names.
- (25.) Complaints have been made of the want of any general knowledge throughout the country of the operations of the Ordnance Survey.
- (26.) Some minor suggestions have been made.
- (27.) The report of the War Office Committee on a military map of the United Kingdom has been laid before this Committee, and it contains suggestions affecting the general map of the United Kingdom.

(1.) *Want of revision.*—This has already been dealt with under the Second Head of reference. (See page ix *et seq.*)

(2.) *Want of uniformity of style and paper.*—This fault applies mainly to the 6-inch and 1-inch maps. No appreciable objection has been made on this ground to any of the other scales.

As regards the 6-inch maps, the complaint originates principally in the change from the engraved to the photo-zincographed map. It is unquestionable that the engraved map is superior to the photo-zincographed in execution and style. The engraving was found, however, very expensive as well as extremely slow. In 1880 it was decided to publish future 6-inch maps by photo-zincography. This process is not only far cheaper, but enables the maps to be published within a few months of the completion of the field survey. The evidence taken by us shows the photo-zincographed map to be a good practical map, although it has not the finish of the engraved map. We approve of the course which has been taken with regard to this map, and recommend its continuance.

The complaint of want of uniformity applies also to the paper. The first edition of the 6-inch photo-zincographed map was on yellow paper, which was found to be too soft for use by the public, although well adapted for printing. It was therefore abandoned, and a white paper is now used, which is apparently uniform in quality and colour. Neither of these papers, however, agree in tint or in size of sheet with that used for the engraved 6-inch, which formed the first portion of this series of maps. This discrepancy is unavoidable, owing to the difference of the processes employed, unless the engraved plates, which are much the more beautiful, be abandoned, which seems hardly desirable. The avoidable want of uniformity in the photo-zincographed maps caused by the use of yellow and white paper will cease as soon as the stock of yellow paper maps is sold out.

It may be a question whether the full sheets, such as the engraved 6-inch maps, are more desirable as to size than the quarter-sheets now produced. The adoption of the latter size is due to the optical difficulties which arise in reducing large surfaces by photography in such a manner as to retain the truth of the reduction. It is possible that these difficulties may eventually be surmounted, but no recommendation on the subject is at present possible. In some respects the quarter-sheets are handier; many persons only want a plan of a limited area, which they may get within the limits of a quarter-sheet, and consequently they are not under the necessity of buying more map-surface than they require. The existence of the quarter-sheets has, without doubt, very considerably expedited publication, as they can be produced as soon as the survey is completed over four sheets of the 25-inch scale, without waiting for the completion of the whole 16 sheets which are comprised within the limits of a full 6-inch sheet. In some cases this means an earlier publication by many months.

The effect of the change of size is peculiar, as it results in the superior engraved map being sold at a cheaper rate than an equal area produced in a somewhat inferior form by photo-zincography. The engraved full sheet is sold for 2s. 6d. The four photo-zincographed quarter-sheets are sold for 4s. This difference is due first to

the fact that one large sheet can be printed nearly as quickly as a small one, and secondly because a larger proportion of the cost of production is charged against the cost of publication in the case of a photo-zincographed than in that of an engraved map. The method of assessing the costs admits of explanation, a portion of the capital cost being charged in one case which has been written off in the other. (See Q. 605 and Appendix IX.); but it results in the anomaly, inexplicable to the public, of the superior map being cheaper than the inferior.

We recommend that such a modification be made in the method of assessing the cost as will enable equal areas of the 6-inch map, whether engraved or photo-zincographed, to be sold to the public at least at the same price, say, the engraved sheets at 3s. each and the quarter-sheets at 9d. each. This may entail a small loss to the public; but the present anomaly is so great that we think an end should be put to it in some manner.

The want of uniformity in the 1-inch maps is due solely to the varying dates of publication, and will disappear as soon as the new 1-inch map is completed and regularly revised.

It may, however, be urged that important as is uniformity in style, it is not the sole consideration. In a work like that of the Ordnance Survey extending over many years improvements will suggest themselves. If absolute uniformity of style were insisted on it would bar all improvement.

With regard to the question of uniformity in so far as it depends upon the character of the paper employed, we have to make the following remarks.

The Ordnance Survey does not purchase its paper, but obtains it through the Stationery Office. It appears in evidence that while the Stationery Office is anxious to meet the wants and requirements of the Ordnance Survey, there is necessarily a difficulty in conveying to manufacturers the description of special wants and requirements through the medium of a second department. At times this difficulty has led to the supply of paper unsuited for the work, and to difficulty in getting paper for experimental purposes. At present, and for the last two or three years, the Ordnance Survey has been fairly satisfied with the paper which has been supplied to it, but there is no security for the continuance of this condition.

The evidence shows clearly the necessity for adhering to the same manufacturer and "make" if uniformity of paper is to be secured. We recommend that arrangements should be made with particular manufacturers to supply special standard papers, suited to each scale of map over long periods of time. It is only by some such course as this that reasonable uniformity of paper can be secured. This is the course which has recently been tried with satisfactory results.

The Ordnance Survey is in a totally different position from that of an ordinary map publisher in this particular, that when the latter intends to produce a map he can by a single purchase secure the paper he requires. The edition is complete in itself and has not to match anything else. The Ordnance Survey, however, is always publishing maps, and when a new edition of any sheet is required it is desirable that the new edition should be printed on paper exactly similar to the former edition (which may have been printed many years before) in order to enable it to match the adjoining sheets. It is impossible to secure such uniformity with a varying supply of paper from different sources.

While we fully recognise the advantage of using the agency of a single Department like the Stationery Office in procuring supplies of an ordinary character for all departments of the public service, we do not consider such agency of equal advantage in the purchase of articles of a special and technical character. The Ordnance Survey Department already purchase their own instruments, photographic machinery, metals, glass, and other technical materials, and we think very properly so. We would add paper and other printing materials for their maps, as being also technical material.

On these grounds, and bearing in mind how vitally the quality of the paper supplied affects the Survey maps, we recommend that the conditions of the paper supply for maps should be reconsidered and that the Ordnance Survey should be allowed to control its own supply.

A standard paper for each class of map should be fixed on and strictly adhered to, but we see no objection to varying the papers for editions not intended to be brought together. For instance, the 1-inch outline map might be printed on a rough drawing-paper suited for persons drawing on the map, while the 1-inch hill-shaded map might

be printed on a finer and smoother paper better suited to give perfect definition to every line of the engraving.

(3.) *Insufficiency of contours.*—We have had a good deal of evidence to the effect that sufficient contours are not shown on the present maps of the Ordnance Survey, and the more elaborate contouring of the Lancashire and Yorkshire plans has been contrasted with the more recent work in which far fewer contours are given.

In Lancashire and Yorkshire it may be said, broadly speaking, that there are contours at 25 feet vertical intervals up to the tops of hills. Most of these contours were sketched in by the aid of a waterlevel, but those at 25 feet, 50 feet, and thence every 50 feet up to 400 feet were instrumentally traced with accuracy. Above 400 feet the instrumental contours are at varying intervals of from 100 to 400 feet.

In 1854 a very strong Committee with the Earl of Ellesmere as chairman was appointed to investigate and report upon the subject of contouring. The members of this Committee were—

The Earl of Wrottesley, Mr. J. K. Brunel, General Sir J. F. Burgoyne, Sir Roderick E. Murchison, Sir H. T. De la Beche, Professor Lewis. D. B. Gordon, Mr. James M. Rendel, Mr. C. Vignoles.

The points referred to them were:—

“(1.) Whether the advantages to the public to be derived from the exhibition of contour lines on the Ordnance maps are commensurate with the cost of their production?”

“(2.) Whether the advantages which are derivable from this system may or may not be attained to a sufficient extent and at a considerably less cost by the adoption of any other process.”

This Committee reported as follows:—

“We are of opinion—

“(1.) That a map founded on a national survey should have recorded upon it numerous surface levels laid down with great accuracy.

“(2.) That levels should be taken on certain principal lines and at defined prominent points, selected on some well-established principle, and such in particular as can be easily identified subsequently; the levels should be given in feet, and with one or two places of decimals in addition, according to circumstances, and inserted in each of the maps proposed to an extent proportionate to their respective scales.

“(3.) That primary levels will be more practically useful when given upon roads and highways, railways and canals, and on bridges, milestones, churches, and other substantial buildings, tops of hills, and all well-defined summits, as well as along streams and watercourses. On most of these situations will be found permanent surfaces on which the levels should be distinctly inlaid and marked for future reference; and at many other sites artificial benchmarks should be fixed in a very permanent manner, for the levels given on a map may be considered as of far more practical utility in proportion as they can at any time be ascertained with precision on the ground.

“(4.) That the levels as above described having been provided, contour lines to a certain extent would be a useful addition to a map on the 6-inch scale, and well worth an outlay of 5s. per lineal mile, this being the cost of contouring as estimated by Captain Gosset, on the assumption that the levels above mentioned have been previously obtained and recorded; these contour lines should be instrumentally traced with accuracy, and the system of interpolating contour lines should be abandoned.”

The report of this Committee was approved. Their recommendations regarding levels and bench-marks have since been carried out. Interpolated contours have been discontinued, and accurate instrumental contours have been shown at 50 feet, 100 feet, and at every subsequent 100 feet up to 1,000 feet. No contours have, since these recommendations were adopted, been shown above 1,000 feet.

The opinion of so eminent a Committee as that of 1854 must carry great weight. It should be remarked here that the cost of instrumental contouring has been found to be about 17s. per lineal mile, instead of 5s. as estimated in their report.

A considerable proportion of the demands for additional contours comes from persons who would be quite satisfied with sketched contours. They require them, in fact, for representation of the ground, not for accurate engineering purposes. On the other hand, eminent engineers, the present Director-General of the Geological Survey, and others, have shown how greatly a more complete system of contouring would increase the practical value of the 6-inch maps. In some foreign countries contours are shown at intervals of a few feet and are so numerous as to give almost the effect of hill-shading. Such contours are of course sketched in between observed contours more or less close. Intermediate between such elaborate sketch-contouring, and the accurate instrumental contouring of the present Ordnance Survey maps, comes contouring with a water level such as is shown on the Ordnance Survey maps of Lancashire and Yorkshire (see Appendix XII.).

Instrumental contours are traced with a contouring theodolite, water-level contours with a water level, and sketch contours with an Abney's level aided by eye sketching.

We are informed that the error of the instrumental contours is not allowed to exceed $3\frac{1}{2}$ inches after closing a line of 25 to 30 miles in length, whilst the closing error of a water-level contour of the same length may amount to as much as from 1 to 4 feet, but the error in the contour after adjustment is probably never so great as 1 foot; whilst a sketched contour is necessarily of still less accuracy.

A perfectly contoured map might be held to be one that was closely contoured from the sea level up to the tops of the highest hills. Nothing prevents this from being done, except the enormous cost, which would probably be considered to be entirely out of proportion to the advantages to be derived from such expenditure.

Whilst giving full weight to the opinions we have received as to the desirability of additional contours, we desire to point out that the purposes which these contours would serve, (with the exception of the requirements of the Geological Survey, which extend over the whole surface of our islands,) exist, as a rule, only in a comparatively small portion of the country. Waterworks, railroads, and other engineering works are likely to be carried out only in relatively limited areas, and the same remark will probably apply to military requirements.

We are also of opinion that no contouring, however close, will obviate the necessity of special contouring and levelling for the execution of engineering works.

Such being the case, we hesitate to recommend any very great expenditure for extending the present system of contours in the complete and thorough manner which has been suggested. We consider it very doubtful whether it is necessary to apply, at great cost, a system to the whole country which is likely to be of material benefit only to small portions. The answers we have received from three eminent civil engineers also embody this view of the question, see evidence, pages 229 and 230.

It must be borne in mind, moreover, that the system of levels which has been carried out in great detail over the whole country affords much assistance in determining heights for engineering and other purposes, and that, in the opinion of some engineers, these are even more valuable than the contours.

The additional contours which have been chiefly recommended, are those at the following heights above the sea, 25, 75, 150, 250, 350, and, by some, at 450, 550, 650, 750, 850, and 950 feet. and at every 250 feet afterwards to the tops of the hills.

The Director-General has furnished the Committee with an approximate estimate of the cost of the different suggested additions, but it must be understood that the data on which they are based are very uncertain.

1. Instrumental contours at 25 and 75 feet above the sea :—

	£
England - - - - -	38,000
Scotland - - - - -	8,000
Ireland - - - - -	6,000
	<u>£52,000</u>

2. Instrumental or water-level contours at 150, 250, and 350 feet above the sea :—

	Instrumental.	Water Level.	Mixed.
	£	£	£
England - - - - -	122,000	40,600	95,500
Scotland - - - - -	24,000	8,000	18,700
Ireland - - - - -	15,000	5,000	11,700
	<u>161,000</u>	<u>53,600</u>	<u>125,900</u>

The "mixed" column is based on the assumption that the contours are instrumental where the ground is not steep, and water level when it is steep. In the latter case an error in levelling is much less appreciable.

3. Water-level contours at 450 feet, and every 50 feet between the 100-foot contours up to 950 :—

	£
England - - - - -	34,000
Scotland - - - - -	17,000
Ireland - - - - -	3,500
	<u>£54,500</u>

It is considered that the error of water-level contours will be of less importance at greater altitudes than 400 feet.

4. It is understood that for military requirements sketched contours at every 25 feet are required and some other additional information. The Director-General estimates this at about 75,000*l.*, the work being done by staff officers.

5. Contours at 250 feet intervals above 1,000 feet interpolated by water-level:—

England	£	15,000
Scotland		5,000
Ireland		3,500
Total		<u>£23,500</u>

The total expenditure, if the whole of the work were carried out, would therefore be—

	£
1. - - -	52,000
2. - - -	125,900
3. - - -	54,500
4. - - -	75,000
5. - - -	23,500
Total	<u>£330,900</u>

If any of this work is undertaken the distinctions between instrumental, water-level, and sketched contours should be clearly marked by adequate characteristics. In the case of the mixed contours recommended there would be no objection to the contour line changing its characteristic, when necessary to mark its passage from instrumental to water-level.

The whole of the contours might be completed in 10 years.

We think that No. 5 is the most important, and should be carried out at as early a date as possible. It affects a comparatively small area of country in which the map has not been completed in this particular as in other districts. It has been already done in part for Scotland. It is a feature required by the Geological Survey; and is of the greatest service for ascertaining the water-sheds for high-level water supplies, and occasionally for mining purposes, while at the same time it is a matter of general interest to the whole community.

Nos. 1 and 2 are required for military purposes, and have also been asked for by several non-military witnesses. We consider that the two contours of 25 feet and 75 feet, if confined to districts where there are large areas of low-lying lands, would be very useful. There would be no occasion to carry a 25-foot contour line round every cliff line or small valley running to the sea. The military authorities would be satisfied with sketch contours, but if the expense is to be incurred, we think it eminently desirable that the work should be properly done with accuracy sufficient for other purposes. Such accuracy can only be provided when either instrumental or water-level contours are used according to the nature of the ground.

The contouring in Ireland, on the same scheme as has been more recently adopted for England, is in progress, and any additions made to the English system should be adopted for Ireland, a distinction being drawn between the cultivated and uncultivated districts as has hitherto been done in Scotland. As accuracy in the position of contours on the map is essential we recommend that the contours should remain in black on the 6-inch map, and that no colour printing be adopted for this scale.

(4.) *Desirability of introducing heliogravure or some more rapid method of hill-shading for the map of England.*—This matter has already been dealt with at pages xviii and xix.

(5.) *Inconvenience caused by numerous meridians.*—Some objections have been raised to the scheme on which the Ordnance Survey has been based in regard to meridian lines. There can be little doubt that if the manner in which the large-scale maps would eventually be used, and the whole scope of the survey had been thoroughly grasped at the time of its initiation, the work would probably have been plotted on meridian lines at equal distances. All the sheets lying east and west of each other would also have been bounded north and south by the same parallels of latitude. The original idea was to produce parish maps and county maps on a large scale, not necessarily capable of being joined to one another, and even now the term “parish maps” is often used to describe maps on the 25-inch scale, and “county maps” those on the 6-inch scale. The great inconvenience, however, that arises from the irregular boundaries of parishes and of counties being the boundaries of maps included in a rectangular sheet of paper has of recent years led to a change of practice. The sheets

are now wholly filled up with the geographical detail included within the area of the sheet, irrespective of where the county and parish boundaries fall.

In consequence of the original intention to survey and map each county separately, a central meridian was selected for each county or small group of counties on which to plot the survey. The large-scale survey was commenced in Ireland, and hence for the 32 counties of that country there are 32 distinct meridians. For the 33 counties of Scotland there are 24 meridians, while for the 52 counties of England and Wales, which was the last portion of the kingdom surveyed, only 19 have been used. It is thus evident that as the survey proceeded the initial mistake was recognised and was in part corrected by the adoption of a common meridian for several counties. To carry out this change now in a complete manner would in theory be correct. Five meridians or even less would suffice for all England inclusive of Cornwall and the Isle of Man (four of these being common to Scotland, and one more being required for the western counties), but the cost of doing so, involving, as it would do, the re-drawing and re-engraving of all or most of the sheets and plates, is prohibitive, for it is estimated at about a million of money.

We do not consider that any serious inconvenience is caused by the varying meridians and parallels of latitude for sheets lying approximately east and west of each other, since the method of filling up the blank portions of the sheets has been adopted. In proof of this belief it may be mentioned that the Engineer of the Lancashire, Derbyshire, and East Coast Railway, who had recently laid out this line on the 6-inch maps from Warrington to the coast of Lincolnshire, across the whole of England from west to east, was not aware that the maps he used had been plotted on three meridians. We may also mention that, trying the experiment for ourselves, we found no difficulty in joining up adjacent sheets on different meridians, beyond the loss of certain portions of the sheets that had to be cut to waste in order to square the marginal boundaries. The joining of the sheets on their indicated sheet lines was as perfect as it was possible for different sheets of paper to be. At present most, if not all, of the 6-inch photo-zincographed sheets have been filled up. The engraved sheets, however, which were not originally engraved beyond the county boundary have not yet been filled up, and in their case inconvenience undoubtedly results to the users of the maps. We recommend that these plates be dealt with at as early a date as practicable, but we make no recommendation as to any change in the meridians.

(6.) *That the indexes are inconvenient and difficult to understand.*—We have taken a large amount of evidence on this subject. We have come to the conclusion that there are two classes of persons for whom indexes are required. *First*, the general public, who are often totally unacquainted with maps and indexes. For their purposes great simplicity is required, a distinct index being given for each scale, and showing only the sheet lines and numbers of that scale. *Secondly*, civil engineers, land agents, and others who are well acquainted with the subject, and for whom it is an advantage, for facility of reference, to have the sheet lines and numbers of each scale shown on the same index. To meet the wants of these two classes we recommend:—

- (a.) That the town indexes be continued as at present; they appear to give all the information required.
- (b.) That the newest form of index on the scale of 2 or 3 miles to an inch, now in use for the 6-inch maps, be adopted as an index to the 1/2,500 (25·344-inch) scale, showing only the sheet lines of this latter scale.
- (c.) That the same form of index on a separate map be adopted as the index for the 6-inch scale maps, showing only the sheet lines of the 6-inch maps.
- (d.) That the index to the 1-inch map be continued as at present, except that in some parts more names should be given on it.
- (e.) That although the combined index known as the “4-mile index showing civil parishes” is too complicated for ordinary use, it should be retained for the use of civil engineers and others versed in the use of maps.
- (f.) We have pointed out the indexes which we think most desirable, but the Director-General should be left free to adopt any others he may think fit.
- (g.) We consider that reference to the indexes will be much facilitated if a uniform style of heading is adopted. A form for this is suggested which, *mutatis mutandis*, can be made available for every scale. The scale should be always represented thus “25·344 inches to the mile,” as well as by the representative fractions, “ $\frac{1}{25300}$,” &c. The scale of the index should always be at the bottom of the index, and should not form part of the title.

ENGLAND AND WALES.

INDEX

TO THE

ORDNANCE SURVEY

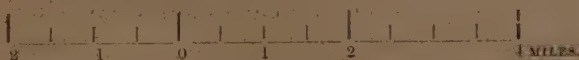
OF

LANCASHIRE,

SHOWING THE PLANS ON THE SCALE OF

25·344 INCHES TO 1 MILE ($\frac{1}{2500}$).*(Index Map comes in here.)*

SCALE OF THIS INDEX 2 MILES TO 1 INCH.



(h.) We recommend that the table of areas of parishes be no longer printed on the index to the 6-inch maps, but be published in pamphlet form. This pamphlet should be issued for each county, with the general county information in it as to areas, census population, towns, &c., and should contain sketch-indexes, on a small scale, of each of the index maps, making it in fact a rough index to all the scales other than the town scales. The remainder of the pamphlet should comprise information common to all England, particulars as to the nature of the survey, places where the maps may be obtained, prices, conventional signs, possibly an elementary preface on the use of maps, or on map reading, and it should contain the table now inserted in the area books for converting decimals of acres into roods and perches. The best form would probably be a pamphlet with a fancy paper cover, to be sold at as low a price as practicable, and it should be placed generally in the hands of the bookselling trade and at railway book-stalls. The sketch-indexes already referred to might also be placed separately as leaflets in the hands of the map agents for gratuitous, or nearly gratuitous, distribution. They would thus, in some measure, serve as an advertisement of the Survey.

(i.) We advise that in the event of any partial revision being carried out on any scale the indexes on that and all smaller scales should remain unrevised till general revision occurs.

Some witnesses have advocated indexes being published in advance of the maps so as to show the state of publication. This has not hitherto been done, and the publication of the various maps is so nearly complete that it does not appear to be necessary now.

We do not recommend any change in the catalogue, except that proposed by Mr. Stanford, viz., that a list of the 25·344 inch plans in each county should be given.

(7.) *Difficulty of mounting maps owing to shrinkage.*—This difficulty occurs principally with old sheets, and where engraved and photo-zincographed maps are mounted together. The evidence of unofficial, as well as official, witnesses shows that it can never be altogether surmounted. The adoption of a uniform paper for each class of map will reduce it to a minimum. Where engraved and photo-zincographed maps adjoin there will always be difficulty in mounting. Great care is taken by the Ordnance Survey to get the maps as accurate in this respect as possible. Each sheet of paper is measured when dry before it is printed on, it is again measured after printing, and all impressions differing by a certain very small amount from correct measurement are cancelled. We do not think that anything more can be done to ensure accuracy.

(8.) *That colour-printed maps should be published, or that private firms be permitted to publish them.*—It has been strongly urged on our attention that there would be a large demand for maps in a more popular form than in black and white. After full consideration of this subject we recommend that a future edition of the 1-inch map be produced to meet the demands of the War Office, including the conventional signs which it desires—which would also be useful for the tourist districts, the

general outline and writing being printed in black, the water in blue, the hills in brown, and the contours and altitudes in some other tint. As this map would not be used for scientific purposes the slight inaccuracies arising from defective registration in double printing would not be of importance. We do not recommend that the railroads should be inserted in red, as desired by the Military Committee, as we consider that where the roads are marked in colour the railroads are better distinguished in black. We are, however, of opinion that different characteristics should be used in order to distinguish single from double railway-lines. A thin paper edition of this map might probably be desirable, to be sold folded ready for the pocket or in sheets.

We are of opinion that over and above the engraved outline 1-inch map, the 1-inch map with hills, the above-mentioned new 1-inch coloured map for military purposes (which we recommend should also be sold to the public), the 4-mile map, and the 10-mile map, any further maps on the 1-inch or smaller scales required to meet special purposes should be left to private enterprise.

We recommend that reproductions of the Ordnance Survey maps, either by obtaining transfers from the plates of the 1-inch and smaller scales or otherwise should be permitted on the following conditions :—

- (1.) That any map issued by a publisher should not be a mere reproduction of the Ordnance Survey map, but should have some *bonâ fide* difference either in form or matter. For instance, it might be altered in shape or scale, so as to bind up readily in any publication, or in form by being printed in different colours, to bring out some special information.
- (2.) That any firm wishing to obtain leave to publish such a map should send in an application, stating the exact objects of the map, to the Board of Agriculture for transmission to the Controller of the Stationery Office, in whom the copy-right of Government publications is vested, and that the Director-General of the Ordnance Survey should be consulted on the subject.
- (3.) That a certain amount should be paid for the privilege of copying an Ordnance map either as a lump sum or as a royalty on the copies of the map sold, as may be hereafter agreed upon, but that this sum should be rather an acknowledgment than a substantial payment.
- (4.) That no copies or colourable copies of the Ordnance map be allowed to be sold except upon these conditions.

As an indication of what we mean, we may refer to a map which one of our witnesses, Mr. Bartholomew, has produced at our request from a transfer of the 1-inch map of the Loch Lomond district, with which we were allowed to supply him. It has been reproduced on the same scale in colour, like other maps on a smaller scale by Mr. Bartholomew which are largely sold to tourists. Maps of this character should be allowed, we think, to be produced freely by the trade on payment of the cost of the transfer and of a small acknowledgment simply to secure the rights of publication. In such manner the Ordnance publications might be made more useful and acceptable to the public. As no charge is now made in the present sale of maps, except for publication, no loss would be entailed on the public.

Similarly the military map which is to be in colour, and the 4-mile and 10-mile maps might, if desired, be produced for the Ordnance Survey Department by contract with private firms from materials supplied by the Survey Department.

We have no evidence that there is any general desire on the part of the public for colour-printed maps on the 6-inch scale. The inaccuracy resulting from more than one printing seems to make it desirable to continue to produce these maps only in black.

(9.) *That combined sheets of country round towns should be published both on the 6-inch and 1-inch scales.*—We would advise the issue of combination sheets combining all the district round important centres on one sheet instead of its being necessary, as it frequently is now, to buy four or more sheets in order to complete a map of moderate area round an important town, and that this issue should be gradually effected, selecting first those places where the demand for such maps is likely to be the largest, care being taken that the work is done in such manner as not to interfere with or check the current operations of the Ordnance Survey Office. Any improvements suggested from time to time, either in style of execution or in additional information, might be put upon these maps, as they would not be required to join up to other sheets, and consequently any such additions or changes would not clash with the ordinary sheets.

(10.) *That the classification of roads is bad.*—Since the disappearance of turnpikes there seems to be no sound rule regarding the representation of roads on the Ordnance Survey maps, and the subject seems to us to require consideration. We consider that

the classification of roads proposed by the Military Committee of 1891 should in substance be adopted on the Ordnance maps. This classification was as follows, viz., first class, well-metalled roads of over 14 feet of metal, where two carriages can easily pass; second class, well-metalled roads of less than this width, fit for fast traffic at all seasons; and third class, cart roads or tracks not ordinarily used by superior carriages or for fast traffic.

It appears to us desirable that the roads thus classified as first and second class should be of such a nature that the public are certain of having free access over them, not disturbed either by their physical condition or by their being private, and we think that the third class should be broken into a third and fourth class, so as to admit of inferior metalled roads being distinguished from roads and tracks wholly unmetalled.

We therefore recommend the following classification and definitions, viz. :—

First class.—Roads with over 14 feet in width of good metal, fit for fast traffic at all seasons of the year.

Second class.—Roads of similar character with less than 14 feet in width of good metal.

Any of the roads in these two classes which are not repaired by an authority under legal obligation to maintain them, and are in consequence not highways, should be indicated by a slight modification of the characteristic adopted, such as dotted lines. This paragraph would apply principally to roads in public and private parks, private roads of good character, but not necessarily open to the public.

Third class.—Metalled roads of an inferior character, whether maintained by a public authority or not.

Fourth class.—Unmetalled roads, tracks, and green lanes.

A scheme of characteristics has been shown to us by the Director-General which satisfies us that there will be no practical difficulty in representing the above four classes on the maps.

With regard to the representation of roads on the present maps, it appears to us that in some cases they are hardly sufficiently distinguished from other lines or boundaries. The footpaths and contours on the photo-zincographed 6-inch maps are not infrequently apt to be confounded without careful scrutiny. They might easily be discriminated by lengthening the strokes of the broken lines that represent footpaths or in some other simple way.

(11.) *That the expense of coloured impressions is too high.*—The 25·344-inch scale, and many of the town scale maps, are published in two forms, coloured and uncoloured. In the uncoloured form the price is not excessive, and better adapted to the use of engineers and persons desirous of drawing upon them than the coloured form, but in this form they are not easily read. In the coloured form, which is most used by the general public, they become more expensive, ranging up to a maximum of 11s. 6d. in the case of the 10·56-foot plans, and of 23s. in the case of the 25·344 scale. Such high prices, however, are rare, especially in the case of the latter scale.

A great deal of evidence has been taken by us on this point, several hundred circulars having been sent to landlords, land agents, surveyors, civil engineers, borough surveyors, and others. (See Appendix XIII.) The general verdict is in favour of giving up the two forms, and publishing in one form only, with the houses cross-hatched as is at present done on some town plans.

Cross-hatching was tried some years ago and abandoned, and although we have it in evidence that the cross-hatching necessarily renders the work on the map coarser, the feeling in favour of this change is so strong that we consider it should be adopted.

We recommend accordingly that the skeleton form and the coloured one be abandoned, and that the colour be replaced by cross-hatching. This would add comparatively little to the cost of production, would serve all the purposes of colour, and would not interfere to any extent with the use of the map for laying out new works. This recommendation applies both to the 25·344-inch map and the town scale maps, if it should be decided to continue the publication of the latter.

(12.) *That hedge-row timber, single trees, as well as trees, shrubs, and paths in gardens should be omitted.*—On this point also we have taken a large amount of evidence, and have issued several hundred circulars. (See Appendix XIII.) The general opinion is strong that these details are of little value, and that they often actually interfere with the clearness of the maps.

We suggest that whenever any complete revision of a town map takes place, a considerable amount of detail now inserted should be omitted. Such detail is generally

of a transitory nature, is easily put on the map by those interested in it, and is of no general utility, whilst it adds considerably to the first cost and to the certainty that the map will become rapidly incorrect by the removal or alteration of the objects in question. These remarks include trees and paths in gardens, (except paths in public gardens,) all hedge-row trees, single trees unless both isolated and conspicuous or in avenues, lamp-posts, gully-holes, gas plugs, stop-cocks, &c., steps and gratings, temporary erections of no solidity, and small detail usually to be found in the gardens and yards of houses in towns, and all municipal detail not of interest to the general public.

In regard to the 25·344-inch map, there is a general agreement amongst most of the witnesses accustomed to use it that the showing of trees in hedgerows, although adding to the effectiveness of the map, is an encumbrance, by interfering with its utility, and rendering alterations to the map difficult. It is also agreed that whilst it may occasionally be desirable to note the situation of a remarkable tree, which in that case should be marked by a special sign, it is an unnecessary expense, and a constant source of growing incorrectness of the map, to put on it as a surveyed object every isolated tree or small group of trees.

We therefore recommend that when a general revision of the 25·344-inch map takes place, the objects above enumerated for omission on the larger scales should be left out on this scale also, but that woods, forests, avenues of trees, and orchards be shown as at present.

(13.) *It has been objected that the Ordnance Survey maps do not show property boundaries.*—Much has been said by surveyors as to the boundaries of parcels of land on the Ordnance maps being the existing fences, and not the legal boundary of ownership of the soil, which frequently is the edge of a ditch not shown on the plan. We recognise that this is the case; but any other course than the one adopted by the Ordnance Survey is impracticable. It is evident that the Ordnance surveyors can only put on their plans visible objects or features which they can find on the ground, and that unmarked property boundaries can have no place on their plans, as the surveyors can have no authentic knowledge regarding them. When any discrepancy in the computation of areas or frontages, &c. arising from this cause is known to exist, it is easy for anyone interested in the matter to mark on the map by conventional signs the position of the legal boundary, and to reduce or increase the area or frontage, as computed from the Ordnance Survey map by an amount corresponding to the known distance of the legal boundary from the centre of the surveyed fence.

(14.) *That footpaths are shown on the Ordnance Survey plans which do not exist.*—There can be no doubt that some footpaths shown on the Ordnance Survey maps are in no true sense footpaths at all, and are sometimes not even permanent. We think that it is impossible for the Ordnance Survey to discriminate between public and private footpaths, and that the note now inserted at the foot of each sheet meets the difficulty in regard to this distinction in so far as it is capable of being met. We are nevertheless of opinion that by further and more definite instructions to the field surveyors it might be possible to prevent the insertion on the map of numerous temporary tracks, such, for instance, as those made by shepherds going to and from their sheep in the fields where the flocks may happen to be gathered during the time the surveyors are on the ground. Nothing but a well-defined and apparently permanent track should be placed on the map, and such a track should be shown as a footpath whether it is public or private. A little inquiry would always determine whether a track was permanent or temporary, but no inquiries which the surveyors could make would always suffice to determine whether a path is public or private. It may also be observed that the absence of a path on the Ordnance Survey map is no proof that there is not a right of way.

(15.) *It has been suggested that a key to conventional signs should be printed on the margins of the Ordnance Survey maps.*—Such a key has been put on the latest editions of the 1-inch maps. We recommend that a key to the principal conventional signs should be added on the margin of the 6 inch, 25·344 inch, and town scale maps, where room can be found for it. Our recommendation as to the publication of a pamphlet containing, with other matter, a full explanation of the conventional signs, would to some extent meet the want complained of. (See paragraph (h) on indexes, page xxix.)

(16.) *It has been suggested that reference numbers be given up, or that the numbering be by sheets instead of parishes.*—We have taken a considerable amount of evidence on this subject, and have sent out a large number of circulars (nearly 300) to landowners, agents, surveyors, and others asking their opinions. (See Appendix XIII.) There was

a slight preponderance of opinion in favour of numbering by parishes rather than by sheets.

On the further question as to whether it was preferable to stamp the areas on the plans or to publish them in a separate area book, the opinions were slightly in favour of the former.

As regards the question of giving up reference numbers there was a preponderance of opinion against doing so.

We had, evidence, however, that for valuation purposes the Ordnance Survey reference numbers cannot be used, and that for this and many other purposes it would be better to omit numbers, so that any person wishing to have them could insert his own. We also had evidence that the insertion of both numbers and areas on the plans prevents separate areas being given to small enclosures. Further, we found also that the existing method of numbering by parishes entails great difficulty on the Ordnance Survey, that an alteration in the boundary of the parish involves re-numbering and bringing out a new edition of the plans affected, that the numbers must be changed on any revision which discloses alteration in enclosures, and that as, in order to expedite publication, portions of parishes are numbered before the parish as a whole is numbered, the numbering must often be irregular.

We carefully considered whether in the necessary alterations on revision it would be possible, by the use of letters attached to numbers, or in any other way, to retain the old reference numbers whilst supplying the necessary new references; but practical examples placed before us showed that this would be impossible in very numerous cases.

We are of opinion therefore that it would be well upon revision to omit the numbers altogether, continuing to stamp the areas in the enclosures as at present to three places of decimals, to extend the printed areas to much smaller enclosures than at present, and to make use of the printed areas, if necessity requires it, for purposes of identification. It would be rare in any single sheet to find the numerical quantity of any area exactly repeated, and such quantities would probably be more permanent on the whole than the present numbers.

Facility of identification of parcels might also be greatly aided if the sheets were rendered capable of division into squares, lettered points at the north and south and numbered points at the east and west being placed on the margin, so that the reference might be made, *e.g.*, to the area number lying in the square formed by lines D and E intersecting with lines 3 and 4 on any given sheet.

In support of this recommendation we desire to state our opinion that, if the present system of putting reference numbers on the maps should be continued, great confusion and great dissatisfaction must arise in a few years, as soon as revised sheets of the maps are published bearing numbers, which will of necessity, in a great number of cases, differ from those of the previous edition. It would be far better for the public that the original number be represented on the new edition by a blank than by a number which does not accord with the former one, and is to be found on the original edition attached to a different enclosure.

(17.) *It has been suggested that all boundaries except county boundaries be removed from the ordinary 1-inch map.*—We recommend the omission of all boundaries other than county boundaries from the ordinary 1-inch map. For general information as to such boundaries, inquirers could always have recourse to the county diagrams on the scale of 2 and 3 miles to the inch, and for detail they must of necessity consult a larger scale than the 1-inch map, *viz.*, the 6-inch or 25-inch maps. On the 1-inch map the insertion of these parish boundaries is needless and tends to confuse the other and more important details.

(18.) *It has been suggested that maps on certain additional scales be published.*—The maps suggested are—

A 2-inch scale map for part or the whole of the United Kingdom.

A 12-inch scale map of London.

A 40-inch map of the mineral districts of the United Kingdom.

In some mining districts, though not in all, the mining engineers desire to have a 40-inch-to-the-mile map. A wish has also been expressed that much of the existing surface detail should be omitted on any map published for mining purposes. (See Appendix I.) But as such maps, or change of form in maps, would be only of comparatively local and limited advantage, we do not feel justified in recommending their production at the public expense. We feel unable to recommend that any of the three maps here suggested should be produced except a 2-inch scale map to the

extent to which it may be required by the military authorities. We are of opinion that the present scales of the Ordnance Survey meet all the reasonable requirements of the public, and that special scales required for special purposes should be left to private enterprise. We consider that there would be no objection to the production of the suggested maps by private firms in some such way as that suggested in paragraph 8, page xxx.

(19.) *It has been suggested that the depths of lakes and some indication of the depth of water round the coast should be shown on the Ordnance Survey maps.*—It would add greatly to the completeness and utility of the Ordnance Survey maps if, as in Switzerland, the depths of lakes were given, and if some indication of the depth of water and shoals on the sea-coast, taken from the Admiralty charts, were added to the Ordnance Survey maps. Since 1887 the Director-General of the Ordnance Survey in consultation with the Hydrographer to the Admiralty has made arrangements as regards the marine depths, and on recent sheets contour lines have been shown round the coast at depths of 25, 50, 75, 100, 150, and 200 feet, and these contours will eventually be added to all sheets. We approve of this course, and we further recommend that the depths be added to important inland waters. As the lakes are not regularly charted like the sea-coast, it would be sufficient if the depths were given at two or three points.

(20.) *An edition of the 1-inch map and of maps on a larger scale on thin tough paper has been suggested.*—So far as the 1-inch map is concerned this will be met by the recommendations above made on the subject of colour-printed maps, pages xxix and xxx.

For the larger scales the preparation of a thin paper edition would so enormously increase the storage of maps that we are unable to recommend it. On demand, a thin paper edition of any 5-inch map or of those on smaller scales can be had at slightly increased charges. These thin paper copies, if produced, would sometimes be found useful for conveyancing, legal, and other purposes. (See Appendix XVII.)

(21.) *A cheap edition of the 1-inch map has been suggested.*—We recommend that this proposal be carried out by transfer to zinc or stone, and we would suggest for consideration whether a portion of this edition could not be sold folded ready for use.

(22.) *It has been stated that the Ordnance Survey maps are too expensive.*—As regards the large-scale plans we are unable to endorse this complaint except with regard to a few of the more highly-priced coloured sheets on the 10·56-foot and 25·344-inch scales.

No country except our own publishes generally its large-scale plans. Abroad such maps are usually kept in manuscript, and tracings can be obtained on payment. The convenience and economy of the system in force in this country to those who want maps is obvious. The selling price of the Ordnance Survey maps is based on the average cost of production, and assumes that a certain number of each plan is sold, which may or may not be the case. Having considered the whole subject carefully, we are unable to recommend any reduction in price. Whether we have regard to the amount of information conveyed, or the care and labour entailed in production, we cannot consider 2s. 6d. an excessive price for a town plan, or 3s. for a 25·344-inch scale plan containing 960 acres and showing areas, or 1s. for a 6-inch map containing 3,840 acres.

With regard to the 6-inch maps, it was not originally intended to publish them. They were published because it was represented that the cost of tracing six copies would be as much as the cost of engraving. It is obvious that the present price of the 6-inch maps is based on other considerations, and is in itself moderate, but for reasons already explained we have recommended a reduction in the price of the 6-inch photo-zinco-graphed maps (pages xxiii and xxiv).

Considering that the 1-inch map is printed direct from the copper, we do not think that the price of 1s. per sheet for England and Ireland and 1s. 9d. for the much larger sheet published for Scotland is excessive. We have recommended (para. 21) that a cheap map, printed from zinc or stone, be issued.

(23.) *The question has been raised whether boundaries should be revised on the Ordnance Survey maps as soon as altered, or whether they should wait for general revision.*—This has been dealt with at page xv.

(24.) *Stress has been laid on the inaccuracy and insufficiency of names.*—We prefer to deal under this heading both with the general reference as to names and the special one made to us in consequence of Mr. Ellis's question, asked in the House of Commons, referred to on page iii.

We are of opinion that the principle on which the names have been ascertained, viz., the submission of every name to at least three competent persons, whose names and

addresses are on record, and whose evidence forms the authority for its spelling and correctness is a sound one. We believe that the errors, with the exception of some in the Welsh maps, are no more than are inseparable from every cartographical undertaking such as the Ordnance Survey. In the necessary reduction of the number of names from the 6-inch to the 1-inch map difficulties have occurred in making a good selection, as the work is done at Southampton by officers who may have no local knowledge of the district represented. In the old 1-inch maps the names were specially collected on the spot for these maps, and not more than could be placed on the maps were taken. For the new 1-inch map the names are culled from the vast number of names shown on the 6-inch map including, indeed, almost every name existing in the country. The difficulty of choosing the most important names has been recognised, we are informed, by the Survey Department, and a surveyor is now sent to the ground to obtain the necessary information for the selection of names. Special attention should be given to placing on the map the names of isolated houses, farm buildings, and woods, so far as space will permit, whilst house and place names in proximity to named clusters of houses may very well be omitted, unless of a conspicuous character.

But the above general approval of the accuracy of the names in England is subject to qualification as regards Wales, where the difficulty of a language not understood by the surveyors had to be encountered. It was thought that this difficulty had been surmounted by entrusting the revision of the spelling of the names collected to a Welsh gentleman well-versed in the language, and subsequently to his widow. It is not necessary to throw any doubts on their competency; the task they were set to do was a difficult one, for the source of the error was at the fountain-head. First it arose from the varying dialects in Wales, which render it almost impossible for one person to be an authority in all counties, and secondly, from the incorrectness of form, name, and spelling as well as from occasional paucity of the names collected, owing to the want of knowledge of Welsh possessed by the surveyors who collected the names. Every survey party should have been provided with a Welsh-speaking person. In consequence of this precaution not having been taken, lead works have been described as slate works, copper works as manganese works (Q. 5600-1). The sound of a name is in the first instance incorrectly caught, and written down by a person ignorant of the language; this is then conjecturally corrected, from the faulty pronunciation so written down, by a person having no local knowledge. Thus Caér-gorlan, the field of the sheepfold, becomes Caér-goleu, the field of light, and Cae Fali, Mary's field, becomes Cae-valley, a mixture of Welsh and English.

We have been asked by one of the expert Welsh witnesses to sanction the introduction into the writing of Welsh names of letters not ordinarily used in printing. We are of opinion, however, that no sufficient use of these letters in the ordinary printing of Welsh has been shown to us to justify such an innovation. The late Dr. Owen Pughe attempted some such changes in the first edition of his dictionary at the commencement of the century, but in the preface to the second edition published in 1833 he states that he abandons the special characters in order that he may better please the taste of the public in general.

We have had before us a Book of Instructions, prepared by the Ordnance Survey Department for the use of its surveyors in Wales, in which the practice to be adopted in the determination and spelling of names is laid down. The rules given in this book seem to us to be based on sound principles. We give the following extract as an example:—

“Rule 15.—When names have assumed a corrupted form which is thoroughly established, their orthography should not be altered, even when they are known to be etymologically wrong; as, for instance, ‘Hylas’ for ‘Heol-lâs.’”

This advice appears to us to be thoroughly sound, and is in accordance with the practice in England, where no attempt is made to restore ancient forms of spelling now disused, although probably the following of this rule accounts for some of the alleged errors which scholars of the Welsh language point out. The particular rules laid down in the Book of Instruction for the use or omission of the article seem to be precise and proper with regard to names to be placed on a map.

After hearing the evidence on this subject of Mr. Evans, Mr. G. T. Williams, and General Jones, who are all Welsh scholars, and having had written communications from Mr. Gee, Chairman of the Denbighshire County Council, Mr. Lloyd Williams, surveyor of the same Council, Mr. Owen S. Wynne, lately agent to Sir Watkin W. Wynn, and Mr. Walter B. C. Jones, a very large estate agent and county treasurer of Carnarvonshire, all Welshmen, well qualified to give an opinion on the subject, and having constant occasion to use the Ordnance Survey maps, we have come to the conclusion that there is no sufficient amount of error in names to induce us to

recommend that the publication of the 1-inch maps of the Welsh counties, now on the point of taking place, should be suspended. To delay publication would cause greater public inconvenience than is likely to arise from a few inaccurate spellings.

We are of opinion, however, that a certain amount of error and omission exists, especially in the wilder districts, which is inconsistent with the accurate character that a Government map should possess. We recommend that previous to the revision, which, through our report, we hope will become the regular practice of the Survey, arrangements should be made for generally checking the names in the Welsh counties through a local inquiry conducted by persons able to communicate with the people resident in the locality, and especially with the shepherds and miners in the less cultivated districts. The results so obtained should be looked over by competent Welsh scholars, who should correct the words collected strictly in accordance with the general rules laid down in the Book of Instructions. We are strongly of opinion that when any method of spelling has been distinctly established in a locality it should be followed, and that no attempts should be made, by change of spelling, to attach a meaning to a name for which perhaps there may be no authority, and which might be at variance with that adopted in the locality.

It would probably be desirable that the Welsh scholars above referred to should be different for different parts of the country, in consequence of the variation in dialects already referred to. The proofs of maps should always be looked over by a person acquainted with Welsh in order to avoid errors in the engraving of the names after they have left the hands of the original corrector. The names of the persons responsible for the orthography of the Welsh sheets might with advantage be placed on the map.

(25.) *The want of any knowledge throughout the country of the operations of the Ordnance Survey.*—We have received strong evidence of the utter absence throughout the country of any knowledge of the operations of the Ordnance Survey and their results. This ignorance appears to be traceable to three causes:—

- (a.) The obsolete and unrevised condition of the greater portion of the Ordnance Survey plans, which has resulted in an indifference towards them on the part of the public, and their supersession by those supplied by private firms.
- (b.) The inadequacy of the steps taken to diffuse a general knowledge of the Survey operations throughout the country.
- (c.) The present system of selling the Ordnance Survey maps through three agents only, in London, Edinburgh, and Dublin.

The first cause will, we think, disappear as soon as the revision which has been recommended is carried out.

The second cause will, we trust, be diminished or removed if the small book of information which we have recommended is prepared, and care is taken to disseminate it as widely as possible.

As regards the third cause, up to 1884 agencies for the sale of Ordnance Survey maps were given to 142 of the principal booksellers in the towns throughout the kingdom. These persons communicated originally directly with Southampton, and later with the Ordnance Depot in London, and were able to obtain maps and information immediately from headquarters. The result of this relation was to establish in every county one or more centres to which all could apply when they wanted Ordnance Survey maps and information, and, as the booksellers obtained 25 per cent. discount, it was their interest to disseminate such information as widely as possible.

This system seems to have possessed advantages which the present does not possess. As, however, another Committee has dealt with this subject we will refrain from doing more than pointing out these facts. We understand that Mr. Stanford is about to appoint a large number of additional agents.

(26.) *Some minor suggestions have been made.*—These are:—

- (a.) *That town indexes be published without sheet lines as an advance edition of the 6-inch map.*—We are unable to recommend this plan for adoption.
- (b.) *That the agents' names and addresses be printed on all Ordnance Survey Maps.*—We cannot agree to this proposal on account of the cost which would be entailed if the agent were changed.
- (c.) *That printed notices of publication be sent to certain firms of map agents.*—This may not, perhaps, come strictly within our terms of reference, but we are of opinion that the weekly notices of publication now furnished only to Messrs. Stanford should be sent to the leading firms of map-sellers throughout the three kingdoms.

(d.) *In the elimination of detail from the 25-inch map before reduction to the 6-inch scale, it has been suggested by the Director-General that the boundary descriptions (4 ft. R. H., &c.) be omitted.*—We are of opinion that this would tend to clear the 6-inch map from unnecessary matter, and we approve of the suggestion.

(27.) *Various suggestions have been made by the War Office Committee (1891) on a military map of the United Kingdom which affect the general map of the United Kingdom.*—Except on a few minor points we concur in the recommendations of the Military Committee as far as they affect the general maps of the Ordnance Survey.

We concur generally in their opinions as to the 1-inch map in outline. As already stated, we consider that there should be a black edition, on which the contours should be printed in black, not in colour, and that there should be a coloured edition such as they recommend, both being on sale to the public. In the coloured map we consider that railways should be shown in black.

We have dealt, on pages xxx and xxxi, with the recommendations of the War Office Committee regarding the method of classifying roads.

The other maps recommended by the Committee appear to be entirely for military purposes.

We desire further to state that it appears to us that the action of the Ordnance Survey is always guided by instructions from the Treasury. As we consider that it is of the greatest importance to define and distinguish between the responsibility of the Director-General of the Ordnance Survey and that of the Treasury, we recommend that the state of the revision of the cadastral survey and that of the 1-inch map should be entered in the annual report and estimates of the Director-General of the Ordnance Survey under separate headings; further, that this officer should distinctly state whether he finds that the sums provided are what are necessary for keeping up the revision of the cadastral and 1-inch surveys at the intervals for which they are arranged.

The Director-General should record in his annual report all suggestions made by him to the Minister under whom he is placed which he considers essential for the conduct of the Survey, as it is important that the public should know whether the department which they regard as directly responsible for the progress of the Ordnance Survey is in a position to fulfil its duties.

There can be little doubt that if such an arrangement as that here proposed had been in force the revision of the Ordnance Survey would already have been systematically undertaken and been now well advanced.

In conclusion, it will be manifest from our Report that after having fully investigated the subjects submitted to us, we are convinced that the basis of the Ordnance Survey is perfectly accurate and satisfactory. The great necessities of the Survey are obviously completion and early revision, and with these necessities not even any suggested improvements should be allowed to interfere. But should the sums which we have proposed for the purpose of revision be granted, and should the various recommendations which we have suggested be carried out, we confidently anticipate that the public will have no reasonable grounds for complaint as regards this great national work.

In closing our Report we have great pleasure in expressing our appreciation of the valuable service which Major Johnston, R.E., our secretary, has rendered to us, in facilitating our inquiries, and supplying us with information on the many very technical matters into which it has been our duty to inquire.

We regret that we have been deprived of the help of our colleague, Mr. Roby, through absence in Australia during the compilation of this Report. He was closely associated with us during the more important part of our inquiry, his views were made known to us, and we believe that he would generally concur in the conclusions we have come to.

Summary of Recommendations.

We offer the following summary of the leading recommendations which we have made in the preceding pages:—

(1.) That the 1-inch map be produced in the following forms:—

pp. xix, xxx,
and xxxvii.

a. An engraved outline map with contours in black.

pp. xviii,
xxx, and
xxxvii.

b. A black engraved map, with hill-shading either in black or in colour.

pp. xxix,
xxx, and
xxxvii.

c. A coloured map on thin paper, adapted to military purposes, but also on sale to the public.

p. xxxiv.

d. A cheap map by transfer to zinc or stone.

p. xxxi.

(2.) That the character of the roads on the 1-inch map be shown in four classes with distinct characteristics.

p. xxxiii.

(3.) That parish boundaries be omitted from the 1-inch map.

p. xxxiv.

(4.) That the contours of the sea bottom round the coast-line and the depths of inland waters be shown.

pp. xviii and
xix.

(5.) That experiments be made in the practical application of heliogravure, and that, if results not inferior to an Austrian specimen map which we have seen be produced, that process be substituted for the existing method of engraving hills and for so much of the country as is then uncompleted in its hill engraving.

pp. ix and
x.

(6.) That special arrangements be made to revise the 1-inch map within the next four years independently of the maps on the larger scales, and that subsequently this map be constantly revised within periods of 15 years.

p. xi.

(7.) That the cadastral maps be revised and brought up to date in the next 10 years, and that subsequently they be kept revised within periods of 15 years.

p. xiii.

(8.) That the publication of these revised maps be carried out by contract, if necessary.

pp. xxxi and
xxxii.

(9.) That detail, such as single trees, footpaths in gardens, &c., be omitted.

p. xxxi.

(10.) That the skeleton and coloured forms of the 25-inch and town maps be abandoned, and the uses of both be combined in one edition having the houses cross-hatched.

p. xxxiii.

(11.) That the reference numbers to parcels of land on the 25·344-inch plans be abandoned on revision.

pp. xxvi and
xxvii.

(12.) That to a limited extent additional contour lines be added to the 6-inch map.

p. xxvii,
pp. xxvii and
xxviii.

(13.) That on the 6-inch map the contours be always in black.

(14.) That certain of the engraved plates of the 6-inch map which are not now filled up beyond the county boundary be as soon as possible filled up to the margin of the plate with the detail of the adjoining county.

p. xxiv.

(15.) That the cost of the engraved sheets of the 6-inch map and that of the quarter-sheets of the photo-zincographed 6-inch map be equalised by a change of their respective selling prices.

p. xxxvi.

(16.) That the Welsh names be gone over and corrected before the first revision of that map.

pp. xii to
xv.

(17.) That the cadastral maps on the town scales be no longer entirely made or revised at the cost of the State, but that the town authorities be required by statute to maintain these maps.

p. xxx.

(18.) That around towns and in tourist districts the existing sheets of the Ordnance Survey on the 6-inch and 1-inch scales be united so as to form special maps of such districts, and that advantage be taken of these maps to introduce any novelties in cartography that may be thought desirable as these maps are not required to be joined to the general maps of the United Kingdom.

pp. x and
xvi.

(19.) That certain authorities be placed under statutable obligation to supply information to the Ordnance Survey Department in order to enable current revision to be better carried on.

- (20.) That in future the term "revision" should be confined to the bringing up to date on its existing scale of a map already published, and that the term "re-survey" be applied to the operations necessary for the production of maps on a scale larger than that on which they were originally published. p. xi.
- (21.) That the Ordnance Survey Department be allowed to control its own supply of paper and printing material. p. xxiv.
- (22.) That the map on the scale of 4 miles to an inch be revised as soon as the 1-inch map is out of hand and be completed with hill-shading. p. xx.
- (23.) That great freedom be allowed to private publishers desirous of bringing out other classes of maps than those specially published by the Survey Department, and that transfers of the maps on the 1-inch and smaller scales be supplied to publishers at cost price, a small sum being paid as an acknowledgment, and that all other reproduction of Ordnance Survey maps be prohibited. p. xxx.
- (24.) That certain recommendations as to indices and catalogue be carried out. p. xxviii and xxix.
- (25.) That a book or pamphlet of information as to the Ordnance Survey be published, general in its main features and special for each county, containing the county indices or diagrams (on a reduced scale) and the information formerly contained in the parish area books, and also the table of parish areas now printed on the index of the 6-inch map, which table should in future be omitted from that map, and that copies of the small indices in this pamphlet be freely distributed for public information. p. xxix.

We have the honour to be,

Sir,

Your obedient servants,

(Signed) JOHN E. DORINGTON.
 ARCH. GEIKIE.
 A. C. COOKE, Lieut.-General.
 H. W. PRIMROSE.
 W. MATHER.
 C. FORTESCUE BRICKDALE.

To The Right Hon. Herbert Gardner,
 President of H.M. Board of Agriculture.

31st December 1892.

APPENDIX A.

INTERIM REPORT

OF THE

DEPARTMENTAL COMMITTEE on the ORDNANCE SURVEY.

We, the Committee appointed last April to inquire into and report upon the present condition of the Ordnance Survey, and the best arrangements for its completion and revision, have not yet concluded our inquiry, but we think it desirable, in order to avoid delay, to report to you at the present time the conclusion that we have arrived at as to the "arrangements which should be made for the continuous revision of the maps on the 1-inch scale," which forms part of the second head of reference to us.

We find that while the old series 1-inch Ordnance Map of England was completed by 1844, it has, with the exception of the addition of railways, never been touched since, and is being gradually superseded as the publication of the new series 1-inch progresses. The latter will be completed in outline either in the engraved or photo-zincographed form by the end of this year for the whole of England, except a part of South Lancashire and South Yorkshire, and in the engraved form for the entire kingdom by 1896.

In the northern parts of Lancashire and Yorkshire the 1-inch new series map is based on the 6-inch scale, which was surveyed between 1840 and 1850, and has not been revised since. For the rest of England it is based on the 1/2500 (25·344 inch) scale survey, some portions of which were surveyed over 30 years ago.

The 1-inch map of Scotland was completed in outline in 1887 from a survey made between 1843 and 1880.

Some parts of the new series 1-inch map of England and of the 1-inch map of Scotland are therefore in urgent need of revision.

The evidence of Sir Charles Wilson, Director-General of the Ordnance Survey, satisfies us that there need be no difficulty in bringing the maps of England and Scotland up to date at a reasonable cost. He estimates that, if the revision of the 1-inch map is carried out independently of the large scales, this map can be brought up to date in four years time at an annual expenditure of from 7,000*l.* to 5,500*l.* per annum, according as the Highlands of Scotland are or are not included, in addition to present expenditure which is about 2,000*l.* per annum; and then, when once brought up to date, a comparatively small annual sum, not exceeding 1,000*l.* or 2,000*l.* per annum, will suffice to secure the constant revision of this map in the field.

This sum of 1,000*l.* to 2,000*l.* for the probable annual cost of normal revision in the field depends on certain arrangements being carried out with local authorities which the Committee will refer to in their Final Report.

We recommend strongly that whatever funds be necessary to carry out the recommendations specified above be provided at as early a date as possible, and

that the Highlands of Scotland be included in the revision.

The 1-inch map of Ireland was completed in outline in 1860, and its revision is in progress. No recommendation therefore appears necessary on this head.

In France the Staff map on the scale of 1/80000 (about 0·83 of an inch to a mile), which is the basis of the other maps of that country, has its revision undertaken annually by the Staff of the Army in such a manner that about one-tenth of the country is dealt with each year.

The 1-inch map is the one most used by the public for general purposes, both military and civil. We recommend strongly that its revision be carried out at all times independently of that of the larger scales, and that whilst railways, roads, conspicuous works, and such alterations as can be properly shown on the 1-inch scale should be always inserted at as early a date after their completion as practicable, the revision should be so arranged that the whole country be gone over and the map brought up to date within periods of 15 years, that each map should bear the date to which it is corrected or revised, and that no map be allowed to be sold which bears on its face a date of publication or revision earlier than 15 years previous.

We have been unable yet to complete the portion of our Report referring to the revision of the large scales. We have received, however, strong evidence of the urgent need which exists for such revision, and recommend that some provision be made in the Estimates for commencing it at the earliest possible date. Our Report will contain an estimate for bringing the revision of the large-scale plans of the Ordnance Survey up to a normal state in 10 years.

In forwarding this Interim Report we beg to state that one of our colleagues, Mr. Roby, M.P., is unavoidably absent in Australia, but we have every reason to believe that he would concur in our recommendation.

We have the honour to be,

Sir,

Your obedient servants,

(Signed) JOHN E. DORINGTON.
ARCH. GEIKIE.
A. C. COOKE, Lieut.-General.
H. W. PRIMROSE.
W. MATHER.
C. FORTESCUE BRICKDALE.

To

The Right Hon. Herbert Gardner,
President of H.M. Board of Agriculture.

12th November 1892.

APPENDIX B.

(See Evidence, Q. 5670.)

ESTIMATE to complete a Revision of the 1-inch Map in outline by the end of 1896.

It is difficult to frame an accurate estimate of the cost of revising the 1-inch map, on that scale, under existing circumstances. The Department does not know where changes have taken place, and the revisers will have to go over the ground pretty closely to ensure that nothing is omitted. This means an expenditure of time and money which, it is hoped, will not be necessary in future revisions. When the 1-inch map has once been brought up to date, the expenditure on revision would be very trifling, not more than 1,000*l.* a year, if arrangements could be made for sending to the Ordnance Survey Department, at the end of each year, information respecting new roads, railroads, canals, docks, and important town improvements. The Department at present receives information as to new railways from the Railway Department of the Board of Trade; but there is no machinery for obtaining similar information as to roads, canals, &c.

It is estimated that the cost of revising the 1-inch map of Great Britain would be:—

	£
Field revision, England and Wales	12,000
„ Scotland	12,000
	24,000

If the Lowland districts of Scotland only are revised the total cost would be about 18,000*l.* The present annual cost of examining the 1-inch map on the ground, and of preparing the drawings for the engravers, is 2,000*l.*, or 8,000*l.* for four years. Deducting this sum from the above amounts gives 16,000*l.*, or 4,000*l.* per annum including, and 10,000*l.*, or 2,500*l.* per annum excluding, the Scotch Highlands, as the amounts required in addition to the present expenditure.

The cost of carrying out the revisions on the copper plates is estimated at—

	£
England and Wales	- 12,000
Scotland	- 8,000
	<u>20,000</u>

In two years' time the outline engravers employed on the new series 1-inch map will be falling out of work, and a certain number of engravers are now employed on corrections, repairs, &c. The sum available from this source is about 8,000*l.* for the four years, leaving 12,000*l.*, or 3,000*l.* per annum, to be provided in addition to the present expenditure.

Summary.			
	£	£	
Field revision	- 24,000 or 18,000		
Deduct present expenditure	- 8,000	8,000	£
			16,000 or 10,000
Engraving	- 20,000		
Deduct present expenditure	- 8,000		
		<u>12,000</u>	<u>12,000</u>
		<u>28,000</u>	<u>22,000</u>

That is 7,000*l.*, or, excluding the Highlands, 5,500*l.* additional expenditure per annum for four years.
30/7/92. C. W. WILSON, Colonel.

APPENDIX C.

(See Evidence, Q. 360-1.)

ANNUAL VOTE required to bring Great Britain up to the 15-year limit in 10 years from 1st April 1893.

Financial Year.	Present Vote.	Proposed Addition.	Total Vote required.	—
1893-4	£ 217,110	£ 16,000	£ 233,110	
1894-5	217,110	37,000	254,110	
1895-6	217,110	62,000	279,110	
1896-7	217,110	77,000	294,110	
1897-8	217,110	78,000	295,110	
1898-9	217,110	78,000	295,110	
1899-1900	217,110	77,000	294,110	
1900-1	217,110	77,000	294,110	
1901-2	217,110	62,000	279,110	
1902-3	17,110	46,000	263,110	
1903-4	Undetermined.	20,000	—	To complete publication only.
		630,000		

APPROPRIATION of the additional 630,000*l.* necessary to bring Great Britain up to the 15-year limit in 10 years.

Financial Year.	Revision of Great Britain.	Publication.	Total.	Remarks.
1893-4	£ 16,000	£ —	£ 16,000	
1894-5	32,000	5,000	37,000	
1895-6	47,000	15,000	62,000	
1896-7	57,000	20,000	77,000	
1897-8	58,000	20,000	78,000	
1898-9	58,000	20,000	78,000	
1899-1900	57,000	20,000	77,000	
1900-1	57,000	20,000	77,000	
1901-2	42,000	20,000	62,000	
1902-3	26,000	20,000	46,000	
1903-4	—	20,000	20,000	
£	450,000	180,000	630,000	

July 1892.

C. W. WILSON,
Colonel.

ORDNANCE SURVEY.

REPORT

OF THE

DEPARTMENTAL COMMITTEE

APPOINTED BY

THE BOARD OF AGRICULTURE

TO INQUIRE INTO THE

PRESENT CONDITION

OF THE

ORDNANCE SURVEY:

WITH

MINUTES OF EVIDENCE, APPENDICES, AND INDEX.

Presented to both Houses of Parliament by Command of Her Majesty.



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1893.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

DEPARTMENTAL COMMITTEE

APPOINTED TO INQUIRE INTO THE

PRESENT CONDITION OF THE ORDNANCE SURVEY.

Board of Agriculture, 3, St. James's Square, S.W.

FIRST DAY.

Tuesday, 10th May 1892.

PRESENT :

SIR JOHN EDWARD DORINGTON, BARONET, M.P., THE CHAIRMAN, PRESIDING.

SIR ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
MR. HENRY WILLIAM PRIMROSE, C.S.I.

MR. WILLIAM MATHER, M.P.
MR. HENRY JOHN ROBY, M.P.
MR. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON, R.E., *Secretary*.

(*Chairman.*) I will read the order of reference. The communication I have had from the Board of Agriculture is to the following effect :—

The Board propose that a Departmental Committee be appointed to inquire into and report upon the present condition of the Ordnance Survey, and especially to consider—

- (1) What steps should be taken to expedite the completion and publication of the new or revised 1-inch map (with or without hill-shading) of the British Isles.
- (2) What permanent arrangements should be made for the continuous revision and speedy publi-

cation of the maps (1/500 (towns), 25-inches, 6-inches, and 1-inch scales).

- (3.) Whether the maps as at present issued satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed, and price; and whether any improvement can be made in the catalogue and indexes.

We held a preliminary meeting last Thursday and decided that we would ask Sir Charles Wilson to attend here to-day, and Mr. Crook.

Colonel Sir CHARLES WILSON, K.C.B., K.C.M.G., F.R.S., &c., R.E., Director General of the Ordnance Survey, called in and examined.

1. (*Chairman.*) How long have you held the appointment of Director General of the Ordnance Survey?—Since 20th November 1886.

2. I do not know whether you would prefer to be asked questions or whether you would like to read or give us a general statement?—I have written a short history of the Survey, with references to the Parliamentary Committees and the various orders under which it has been carried on, and if you would allow me to read that first I should like afterwards to explain the difference between the system upon which the survey of England is carried on and that of foreign countries.

3. Then, perhaps, you will read your statement?—The survey of the United Kingdom may be said to have commenced with the measurement of the base line on Hounslow Heath in 1784. A trigonometrical survey of the country for the purpose of producing a military map was ordered in 1791; but it was not until 1797 that the grand design of a general map of the kingdom, founded on a minute survey, was first conceived. This map was published on a scale of 1 inch to a mile, and in 1824 it was advanced so far as to include the whole of the south of England with a part of Wales and a part of Scotland. It was then almost entirely suspended in

order that Ireland might be surveyed on a scale of 6 inches to a mile for a general land valuation in accordance with the recommendation of the Select Committee on the Survey and Valuation of Ireland. I have given the references to the reports so that they can be conveniently obtained.

4. (*Sir C. Wilson, continuing.*)—In 1840 the survey of Ireland, as then ordered, was almost completed, and the military map of England was finished as far north as the southern boundaries of Lancashire and Yorkshire. The 6-inch plans having proved of great practical value for many public purposes beyond that for which they were especially designed, Her Majesty's Government decided to have the six northern counties of England and all Scotland surveyed for plans on the same scale. Yorkshire, Lancashire, Wigtownshire, Kirkcudbrightshire, Edinburghshire, and the Isle of Lewis were in consequence drawn and published on the scale of 6 inches to a mile, and the work which had been previously done for the 1-inch scale in those districts was entirely lost. The principal towns, and those towns in the above counties which contained 4,000 inhabitants, were drawn and engraved on the scale of 60 inches to a mile (1/1056).

Col.
Sir C. Wilson
K.C.B., &c.

10 May 1892.

Report
ordered to
be printed
21st June
1824, No. 445.

Treasury
Minute,
1st October
1840.

- Col. Sir C. Wilson, K.C.B., &c.*
10 May 1892.
- Treasury Letter, 8th June 1841.*
- Report ordered to be printed 10th July 1851, No. 519.*
5. (*Chairman.*) That is the same scale that is at present used for the towns?—No; smaller than we now use for the towns.
6. London is on the 5-foot?—Yes, London is on the 5-foot, but other towns are on the 10-foot.
- And the plans on the 6-inch scale were ordered to be reduced to the 1-inch scale for the completion of the general map of the kingdom on that scale.
- In 1844 orders were issued for a revision of the survey of the northern counties of Ireland, which had been made in the first instance for a townland valuation, and represented only the townland and other boundaries.
- In 1851 a Select Committee of the House of Commons was appointed to report on the survey of Scotland, and recommended that the 6-inch scale should be abandoned, that the contouring should be abandoned, and that the survey for the 1-inch map only should be proceeded with.
- N.B.—The minutes and orders relative to the survey of Scotland, issued after the 1st October 1840, were made to apply equally to the six northern counties of England.
- Orders in conformity with the recommendations of the Select Committee were issued, and parts of Haddingtonshire, Berwickshire, and Lanarkshire were surveyed for the 1-inch scale.
- In consequence of numerous memorials protesting against the change, Her Majesty's Government ordered the 6-inch scale to be resumed, and as a consequence all the work on the 1-inch scale was laid aside as useless.
- In pursuance of this order Haddington, Fife, and Kinross were surveyed and published on the 6-inch scale; but the plans not being approved of by many influential people in Scotland, the Treasury forwarded a circular letter to numerous officials and scientific gentlemen throughout Scotland requesting their opinion as to the most suitable scales for urban and rural districts. At the same time an order was issued to survey Ayrshire and Dumfriesshire "with that degree of accuracy which would admit of the plans of the cultivated districts being hereafter drawn on the scale of 24 inches to a mile if desired."
- The replies to the circular letter having been found to be in favour of a much larger scale than the 6-inch, the Treasury issued a second circular to ascertain whether the 24 inches to a mile, the 26½ inches to a mile (3 chains to an inch), or the 1/2500 scale would be preferable for the rural districts, and whether the 10 feet to a mile or the 1/500 scale would be preferable for towns.
- The replies to the second circular being in favour of the 1/500 scale for towns and the 1/2500 scale for the rural districts, a Treasury Minute was issued directing that the surveys of Ayrshire and Dumfriesshire should be drawn on the 1/2500 scale, and that the course authorised in reference to those two counties should be applied to the survey of other districts. It was also directed that certain scales should be shown on each plan.
- With the Minute is printed an important memorandum by Sir Charles Trevelyan, dated October 19th, 1854, recapitulating the leading points that had been determined by the Treasury.
- Then, in 1855, the Treasury ordered that uncultivated districts should be drawn on the 6-inch scale; that the cultivated districts should be drawn on the 1/2500 scale; that the scale for towns should be 1/500; and that the 1-inch map of Scotland should be proceeded with as rapidly as possible.
- On the 31st July 1854 the Treasury directed that the mode of recording the surface levels of the country should be in accordance with the recommendations of the Committee on Contouring in their Report of 20th July 1854; and that the cost per lineal mile of contouring should be ascertained by experiment.
7. (*Mr. Roby.*) Was that a Treasury Committee or a Select Committee of the House of Commons?—It was a Treasury Committee, and a very strong committee. I have a copy of the Treasury letter of the 31st July 1854.
8. (*Chairman.*) It was a committee of three: the Earl of Wrottesley, Mr. L. K. Brunel, and Sir John Burgoyne?—No; that was a Committee on Scales; the Committee on Contouring was a very strong one.
- The committee consisted of the Earl of Ellesmere, the Earl of Wrottesley, L. K. Brunel, J. F. Burgoyne, Rod. I. Murchison, H. T. De la Beche, Lewis B. B. Gordon, Jas. M. Rendel, and Charles Vignoles; and was for that time, I suppose, as strong a committee as could be formed.
9. (*Mr. Mather.*) That is the strong committee just referred to?—Yes, a very strong committee. That is the only Committee on Contouring that has been appointed.
- In 1855 a discussion arose in the House of Commons on the Survey Estimates, and, the introduction of the 1/2500 scale being strongly opposed, Lord Palmerston stated that it would not be carried beyond Ayrshire and Dumfriesshire until a Select Committee had reported on the subject.
- The Select Committee reported in favour of the 1/2500 scale for cultivated districts, the 6-inch scale for uncultivated, and the 1/500 scale for towns; and they recommended that the contouring and the reduction of the 1/2500 plans to the 6-inch scale should be continued in accordance with the recommendations of the Committee on Contouring of 20th July 1854. The 1/2500 scale was adopted by the Committee as being sufficiently large for certain definite purposes which are detailed at p. viii. of their Report, and also as being susceptible of reduction for geographical uses.
- On the 19th June 1856 a further discussion on the Survey was brought on in the House of Commons, and a motion to reduce the Survey Vote, on the ground that the 1/2500 scale was not necessary, was rejected by a majority of 91. The Report of the Committee was then adopted.
- A Treasury Minute was consequently issued directing the reduction of the 1/2500 plans of Scotland to the 6-inch scale, and their separate publication on that scale.
- On the 18th June 1857 a motion in the House of Commons to discontinue the 1/2500 survey, and proceed only with the 6-inch, was carried by a majority of 10; and the Treasury in consequence directed that the works actually in progress on the 1/2500 scale should be completed, and the 6-inch scale adopted for all new work.
- On the 24th December 1857 a Royal Commission was appointed to inquire into and report upon:—
1. The principal purposes which the National Survey should subserve.
 2. The progress which has been made in the Survey, and the scales upon which the maps and plans have hitherto been drawn and published.
 3. The change or changes in those scales or in any of the details of the Survey which, according to their judgment, should be made.
 4. The estimated cost of completing the surveys of England and Wales, Scotland, and Ireland, respectively, on the scales and in the manner which they recommended should be adopted.
- The Commissioners reported:—
- (1.) That the 1-inch map of the United Kingdom be forthwith completed, engraved, and published.
 - (2.) That the survey of the northern counties of England and of the counties of Scotland proceed contemporaneously, and be completed and published, the cultivated districts on the 1/2500 scale, and the whole on the 6-inch and 1-inch scales, except the Highlands of Scotland, which are to be surveyed on the 1-inch scale only.
 - (3.) That the revision of the 6-inch plans of Ireland be completed.
- The final determination of the question as to the expediency of extending the survey on the 1/2500 scale to the whole of the United Kingdom, or to the whole of the United Kingdom except Ireland, to be left to the decision of the Legislature when the contemplated measures, with which it is more immediately connected, may have been adopted.
10. (*Chairman.*) What is meant by that—"contemplated measures with which it is more immediately connected"?—It appears from the reports of the Parliamentary and other committees that the 25-inch survey was made for certain definite purposes, and I presume the meaning was, that when the Legislature decided that the map should be used for those purposes, the question of completing the kingdom would be taken up.
11. (*Lieut.-Gen. Cooke.*) Was not the registration of land in contemplation then?—The registration of land and the valuation of land for local assessment.

12. Those were the two principal objects, were they not, that were specified for the 1/2500 scale?—There were several objects specified.

13. (*Mr. Primrose.*) Drainage was one, I think?—Drainage, the registration of title, &c.

14. (*Lieut.-Gen. Cooke.*) I think it had more reference to registration?—Registration and local assessment. In consequence of these recommendations the Treasury directed that the survey was to be carried out in accordance with the Minutes of the 18th May 1855 and 25th November 1856.

In 1861 a Select Committee was appointed "to inquire into the expediency of extending the cadastral survey to those portions of the United Kingdom which have been surveyed upon the scale of 1 inch to the mile only." The session being far advanced the Committee only reported evidence and was re-appointed in 1862. The Committee reported that it was desirable that the cadastral survey on the scales directed by the Treasury Minute of the 18th May 1855 and recommended by the Royal Commission of 1858, and again directed by the Treasury Minute of the 11th September 1858, be extended to those portions of the United Kingdom which had been surveyed on the scale of 1 inch to a mile only. They also recommended that the sum voted for the survey should not vary in amount.

15. (*Lieut.-Gen. Cooke.*) Which Committee was this; 1861?—Of 1861 and 1862.

16. (*Chairman.*) Lord Elcho was chairman in 1851 and Lord Bury in 1861, and the others were all Royal Commissions or Departmental Committees?—In accordance with this Report, the Treasury ordered that means should be taken "to prosecute the" cadastral survey on the scales directed by Treasury Minute of 18th May 1855, recommended by the Royal Commission of 1858 and again directed by the Treasury Minute of the 11th September 1858."

In 1866 the Treasury directed that the midland, western, and southern counties of Ireland should be revised on the 6-inch scale as a preliminary to a re-valuation of the land.

In 1870 the Ordnance Survey was transferred from the War Department to the Office of Works, and a report on the state of the Survey at that date was presented to Parliament. The transfer was ordered on the ground that the military map of England and Wales on a scale of 1-inch to a mile had been completed, and that the future work of the Department would be the cadastral map of the kingdom. It was also considered that the cost of completing the cadastral survey should not be included in the Army Estimates.

On the 26th May 1871, after some correspondence with reference to the revision of the 1-inch map, the War Department wrote that "as the present 1-inch map of the south of England, which was published many years ago, is not sufficiently accurate for military purposes, Mr. Secretary Cardwell considers it desirable that as the cadastral survey of that portion of the kingdom progresses, a new 1-inch map with hill features should be engraved or photolithographed."

On the 4th July 1872 the Treasury decided:—

- (1.) That a new 1-inch map in outline with contours and altitudes reduced from the cadastral survey be engraved immediately after the plans on the larger scale are produced.
- (2.) That electrotype duplicate plates be produced and copies therefrom printed for sale.
- (3.) That the hill features be then engraved on the original outline plates, and published as soon as the sheets of a county, or considerable tract of country, can be struck off.

Maps struck off at the stage above numbered as 2, might, at any time, if it were thought advisable, be completed by printing on them hill features by a cheaper process.

In forwarding the above letter the Secretary to the Office of Works stated that the Board were constantly receiving the most pressing applications to prosecute the Survey in various parts of the country, and to issue the maps on the 25 and 6-inch scales, as well as a new 1-inch map at the earliest period. "The issue of the 25-inch and 6-inch scale maps is greatly in arrears of the survey, and it is obvious that the best mode of meeting the public wishes will be to concentrate the resources of the Department on the primary maps; if therefore you should think it better to postpone the engraving of the hills on the 1-inch maps for the present, the Board will be quite ready to sustain that mode of proceeding."

17. (*Mr. Roby.*) What was the date of that?—That was the 8th of July 1872. I have not proceeded with the summary further, the only changes since have been that in 1880 the vote was increased in order to expedite the completion of the cadastral survey, and that the revision of the maps has been authorised. The orders under which the maps have been produced are those which have been stated.

18. (*Chairman.*) Has the last letter, 1872, been cancelled or modified. Is it the direction under which the survey is now being carried on?—The direction under which the survey is now being carried on is the Treasury Minute of the 18th May 1855, confirmed by that of the 11th September 1858, and by Treasury letter of 18th March 1861; these give the scales of the maps.

19. Yes, these settle the scales; but has there been any modification by Treasury direction since that letter of the 8th July 1872?—There have been certain modifications; for instance, the vote was increased to expedite the completion of the large-scale maps. The Treasury have also since that date authorised us to publish Lancashire and Yorkshire on the 25-inch scale, and a sum of money is taken yearly in the Estimates for that work under the head of revision.

20. That is called revision, although it is really a new survey?—In the northern parts of the counties we plot from the old field books; in South Lancashire and south Yorkshire the country has so completely changed since the original survey that we have to re-survey.

21. (*Mr. Mather.*) Referring to the words you read just now from the recommendations of the Board in 1872, the report concludes, I take it, that two plans might be carried out, one with reference to the 25-inch and 6-inch, and the other with reference to the 1-inch?—The instruction of the Board in 1872 was to the effect that if the Director of the Survey considered it desirable to postpone the engraving of the hills and push on the large-scale work, he could do so.

22. That was the sole recommendation?—It was not an order.

23. (*Chairman.*) That the 1-inch map was to follow as speedily as possible on the completion of the large survey; that is how I understood the letter?—Yes.

24. And that in order to hasten the publication of the larger scale maps you might dispense with the hill features for the time and go on with the large scales?—The 1-inch map is published in two forms—in outline and with the hills. Under the instruction, that the 1-inch map was to be based on the cadastral survey, the engraving of the 1-inch map could not be commenced until the cadastral survey of large districts was completed; and the question of producing the 1-inch map was greatly complicated by the preference given to mineral and other districts in respect to the cadastral survey. It frequently occurred that we had 25-inch surveys of mineral districts in different parts of the country that did not cover complete 1-inch sheets, and that we could not publish the 1-inch sheets of those districts until the survey of the surrounding country had been completed. The engraving of the hills could not be commenced until the outline was engraved, so that we had first of all to wait until the cadastral survey was finished to engrave the 1-inch map in outline, and then we had to wait until the 1-inch map in outline was engraved before we could begin the engraving of the hills.

25. (*Mr. Roby.*) In postponing the hill-shading, I suppose it is not that your office would have been employed on something else, but that the expense for the hill-shading would not be forthcoming; the money for the hill-shading would not be forthcoming until you had done the rest. I understand of course that you could not put in the hill-shading till you had got the 1-inch map in outline completely ready; but the Treasury seem to put it that it was left in your option to postpone the hill-shading, was not that rather a question of expense?—No; I think it was partly the view that the old 1-inch map had been published with hills and that the experience in Scotland had shown that the sale of the outline map was larger than that of the hill map, and that it was not of so much consequence to push on the new hill-shaded map. There are several points connected with this question; the difficulty of obtaining engravers with the high artistic skill required for hill engraving, and the fact that Scotland having always pressed more than England for the completion of the survey, the engravers were employed on the map of Scotland.

Col.
Sir C. Wilson,
K.C.B., &c.
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26. (*Chairman.*) This is largely a question of expense; I think we might find out what the expenditure has been. Can you give us the votes of late years?—I have got the votes here from 1858 to the present time.

27. Perhaps you would put them in?—Yes.

RETURN showing the AMOUNT of the VOTE for SURVEYS of the UNITED KINGDOM.

Year.	Amount of Survey Vote.	Year.	Amount of Survey Vote.
	£		£
1858-59	85,000	1875-76	133,500
1859-60	89,000	1876-77	132,500
1860-61	84,600	1877-78	133,500
1861-62	65,600	1878-79	133,500
1862-63	65,600	1879-80	133,500
1863-64	78,100	1880-81	141,500
1864-65	88,345	1881-82	185,000
1865-66	88,345	1882-83	215,000
1866-67	88,345	1883-84	242,500
1867-68	88,345	1884-85	247,500
1868-69	118,600	1885-86	260,500
1869-70	118,500	1886-87	258,000
1870-71	120,100	1887-88	230,000
1871-72	128,700	1888-89	223,000
1872-73	127,210	1889-90	215,000
1873-74	129,210	1890-91	216,000
1874-75	137,500	1891-92	215,770

28. (*Chairman.*) Is this table inclusive of military pay?—No, that is the Parliamentary Vote.

29. (*Mr. Roby.*) Did that alter substantially for some years?—It fluctuated during the Parliamentary discussions; it went down to 65,600. You will notice that in 1881 the vote began to increase: in 1880-81 it was 141,500.; 1881-82, 185,000.; 1882-83, 215,000.; 1883-84, 242,500.; 1884-85, 247,500.; 1885-86, 260,500.; then it began to drop again—1886-87, 258,000.; 1887-88, 230,000.; 1888-89, 223,000.; 1889-90, 215,000., and 1890-91, 216,000. The last increase was given to expedite the 25-inch survey of Ireland.

30. (*Mr. Mather.*) What was the cause of the excessive amount in 1885-6?—The cause was that when the orders were given to expedite the survey on the 1/2500 scale, the staff of the Survey could not be increased at once; the staff was increased gradually, so that the vote went up to a maximum and then began to drop.

31. (*Chairman.*) And between 1885 and 1890 I suppose there had been a considerable reduction in your staff?—I had to commence the reduction of the staff in 1887 and 1888.

32. And since that time there has been a reduction of the staff and other expenditure equivalent to about 43,000. per annum?—Yes.

33-4. (*Mr. Roby.*) Was there any Treasury letter directing the reduction or anything of that kind?—There was no Treasury letter directing the reduction, but there was a Treasury letter reducing the estimate, which of course had to be met by a reduction.

35. (*Lieut.-Gen. Cooke.*) I think Sir Charles has not explained that when it was decided to finish the survey in 1890, anticipating the then probable date of about 1910, a scheme was made out which showed what the expenditure would be in each year from 1880. When was it ordered—from 1880?—1880.

36. Yes, from 1880 a scheme was made out showing what the expenditure would be in each year from 1880 to 1890 and that was sanctioned by the Treasury; was not that so?—That was so.

37. So that it became automatic; as the survey went on the reductions were made?—As the survey went on the reductions were made.

38. (*Mr. Mather.*) Was that with the idea that the whole should be completed in the year 1900?—

39. (*Lieut.-Gen. Cooke.*) When first the question was raised of expediting the survey, I think 1910 would have been about the date of the completion of the survey; it was decided that steps should be taken to complete it by 1890, and then a complete scheme was made out showing what increase of the vote would be required from year to year to carry that out, and how the decrease of vote would occur as the work was concluded, and that became an automatic scheme.

40-41. (*Mr. Mather.*) Did the money granted for completing the survey of 25-inch and 6-inch by 1890 include the revision up to that date of all the maps in existence?—No, it included the survey of those parts of the country which had not been previously surveyed on the 25-inch scale, excepting the 6-inch counties, and that scheme was carried out to the day.

42. (*Chairman.*) In fact, the expenditure from 1880 to 1890 has been regulated by the scheme laid down in 1880, and has not been materially changed, excepting that the Treasury have since that authorised the 25-inch survey of Lancashire and Yorkshire?—Yes.

43. (*Lieut.-Gen. Cooke.*) The original scheme was carried therefore out in its entirety. I think there is no doubt about that, and the fluctuations Sir Charles is now speaking of are owing to alterations of the revision; the re-survey of Lancashire and Yorkshire is really part of the revision; that is to say, when it was determined to revise the country, it was considered that those counties which had only got a 6-inch map should be the first to have the benefit of the revision, and that they should have a 25-inch map; is not that the case?—Yes, that is the case; the votes are larger than they would have been if the Treasury had not authorised the revision.

44. (*Mr. Roby.*) When was it that they authorised the revision?—On the 22nd December 1886.

45. (*Chairman.*) And the present sum granted is somewhat in excess of what would be due to that scheme in consequence of the extra expenditure for the revision of Lancashire and Yorkshire, or what is called the revision?—Yes, it is larger than would have been the case if the scheme had been carried out in its entirety.

46. Can you tell us how much is due to that?—I cannot give you that at present. I have not the figures with me.

47. Perhaps you would put in a return?—Yes, I will do so. (See Appendix XIV.)

48. (*Mr. Roby.*) Some of the money voted by Parliament in 1886 was applied also to revision?—Yes. And the revision which has taken place up to the present time has been entirely in Lancashire and Yorkshire; it is practically a new survey, a 25-inch survey, where there was only a 6-inch survey before.

49. (*Mr. Roby.*) I understand that, at present, with one order and another, you have instructions for the survey of the whole of the three kingdoms on the 25-inch?—Yes.

50. And a reduction from that to the 6-inch, and from the 6-inch to the 1-inch?—To the 6-inch and to the 1-inch.

51. Besides towns on the town scales?—Most of the towns are on the 1/500 scale, but when we took up the revision, which is largely a re-survey, of London, I made inquiries, and I found that as London was such a very large place, Engineers preferred to retain the smaller scale, the 5-foot.

52. Is not the 10-foot scale almost larger than is necessary; is not the London scale sufficient for other towns?—That scale was settled on the advice of very eminent engineers. It is hardly a question that I can go into now.

53. When did the 25-inch survey actually begin?—I mean the first survey?—The first counties surveyed were Ayrshire and Dumfriesshire.

54. (*Chairman.*) England contains 59,651 square miles, and is all published on the 25-inch scale, except parts of Lancashire and Yorkshire, and the plans of all the towns have been published on the 10 foot scale, except in that same district; that is correct, I think, is it not?—Yes, and the plans of all the towns have been published in accordance with the original Treasury Minutes; the towns in Lancashire and Yorkshire are now being placed on the large scale.

55-6. Every town has a plan?—Every town has a plan except towns that have come within the meaning of the Treasury Minutes since the survey; we have had to survey several new towns in Lancashire and Yorkshire.

57-8. (*Lieut.-Gen. Cooke.*) The towns in the counties that have only been published on the 6-inch scale are published on the 5-foot?—Yes; and those that have the 25-inch have town plans on the 10-foot scale.

59. Which are the counties which have been surveyed only on the 6-inch?—Yorkshire and Lancashire, six Scotch counties, and Ireland.

60. (Chairman.) So that in one form or other the whole of England is now published on the 25-inch scale, except Lancashire and Yorkshire, and they are in course of completion?—Yes.

61. (Mr. Mather.) And will be completed in about what time?—I am not quite certain of the date; I think in 1895.

62. (Chairman.) And the first sheet of the original 1-inch maps of England and Wales was published on the 1st January 1801, and the last on the 1st of January 1870; of the new 1-inch 40,657 square miles has been published in outline. Am I not right, Sir Charles?—Not quite right. The original survey for the 1-inch map, made on that scale or on the 2-inch scale, was completed up to South Lancashire and South Yorkshire. Then the 6-inch survey was ordered for Lancashire and Yorkshire, and the 25-inch survey for the northern counties and the 1-inch map of the northern counties was based on the cadastral survey. The 1-inch map of the whole of England was finished on the 1st of January 1870. That included the new-series maps of the northern counties which were never published on the old system.

63. Then, in fact, in these 40,657 square miles is included a certain portion of England which has never been published on the original 1-inch map?—Which has never been published as part of the original 1-inch map. When the cadastral survey was finished in the northern counties, the sheet lines and the meridian of the 1-inch map were altered, and the sheets of those counties are on the same system as the sheets we are now engraving.

64. When it was decided to survey the northern counties on the 25-inch scale the old 1-inch map was abandoned, and a new 1-inch map was commenced, based on the cadastral survey and constructed on a different meridian?—Yes.

65. Since the northern counties of this new series had been completed, the new series was extended to the south of England, and has since been in progress?—Yes. This forms the first portion of the new series which will be extended over the whole of England.

66. (Mr. Mather.) So that finally a new 1-inch will supersede the old one?—Yes.

67. (Chairman.) Out of the total area of 59,651 square miles, 40,657 square miles of the new 1-inch map has been published in outline, and with hills 12,956 square miles. Of these areas 5,352 square miles were published during last year. When was the first of these 1-inch maps of the new series published, namely, of the counties?—May 1857.

68. (Mr. Mather.) What was the first issue of the new series after 1870?—It was January 1874.

69. (Chairman.) All England and Wales has been published on the 6-inch scale?—Yes.

70-1. And all England and Wales, except Lancashire and Yorkshire, on the 25-inch scale?—Yes; excepting the uncultivated districts.

72. (Chairman.) I wanted to get that on the printed report?—That is the exact state.

73. (Mr. Roby.) The whole of England, as I understand, is published on the 25-inch or on the 6-inch, and on the 6-inch only are a few uncultivated bits of England and Wales, also Lancashire and Yorkshire, which have not been surveyed or published on the 25-inch, and the 1-inch survey in those portions is based on the 6-inch?—Yes.

74. (Chairman.) Now we will proceed to Scotland; the 6-inch maps have been published for the whole of Scotland?—Yes.

75. The whole of Scotland is published on the 1-inch scale in outline, and 29,310 miles with hills?—Yes.

76. And on the 25-inch scale 12,687 miles have been published out of 30,902; that is the state of Scotland?—Yes.

77. (Mr. Mather.) About one-third of Scotland?—Yes.

78. (Chairman.) The whole of Ireland has been surveyed and plans published on the scale of 6 inches to a mile?—Yes.

79. And a re-survey on the 25-inch is now proceeding?—Yes.

80. Of which 174 square miles are published out of 32,630?—Yes.

81. (Chairman.) With regard to Ireland the whole of the 1-inch map of Ireland is engraved and published in outline?—Yes.

82. And the preparation for publishing it with hill features is now going on?—The area published with hills is 29,433 square miles of which 567 square miles have been completed during the year.

83. (Lieut.-Gen. Cooke.) It is a curious thing that, when 1-inch sheets are published with and without hill features, the public buy more without than with; is not that the case, Sir Charles?—In Scotland, where both the outline and the hill feature sheets have been published for many years, the sale of the outline is seventeen times as great as the sale of the hill sheets.

84. (Mr. Roby.) And are they the same dates of survey?—They are the same dates of survey.

85. (Mr. Brickdale.) And how about the price?—The price is the same.

86. (Mr. Mather.) And otherwise do they give the same information?—The hill map gives more information in one way, as the hills are engraved on the outline plate.

87. (Lieut.-Gen. Cooke.) It is the same map; the outline is put on a plate, a copy of that plate is taken and on the copied plate, the hill features are put, so that the details are identical in each, there is not the slightest difference; merely with the addition of the hill features.

88. (Mr. Mather.) The hill features rather obscure the writing and some of the detail.

89. (Sir A. Geikie.) This would be true in the districts where the shading is so black that you can scarcely see the names, and I think that is the chief objection to shading maps—that the shading is so dark that it possibly obscures the map?—Yes.

90. (Mr. Roby.) The contour lines are not on the hill maps?—No.

91. (Mr. Mather.) They are omitted from the hill maps, but they are on the outline maps?—They are omitted from the hill maps but are on the outline.

92. (Sir C. Wilson continuing.) If you would allow me, I should like to explain the difference between the English system and foreign systems, because it really lies at the root of the delay in completing the 1-inch map, and of the difficulties attending the revision of the cadastral survey.

93. Very well, will you do that now?—The English survey is based upon the "Principal" triangulation of the whole country. There was first of all the "Principal" triangulation, then the secondary triangulation breaking the larger triangles up into smaller ones, and then there was the tertiary, or what is called the parish triangulation, breaking the secondary triangles up into triangles of about 1-mile sides. The survey of these smaller parish triangles was carried out by surveyors who measured every line rigidly on the ground. The cadastral survey is entirely based upon this smaller triangulation derived from the larger one, and the measurements made on the ground are true within a permissible error of two links in a thousand. The cadastral maps are on the 1/2500 scale, and made from that survey. The town maps, 1/500 scale, are based upon the smaller triangles, broken up into still smaller divisions by "bolting." All measurements are rigid line measurements, and the plans are drawn from the survey; so that in England—I do not allude to errors, there must be personal errors in all work of a large nature,—every part of the survey ought to be accurate within a limit of error of two links in the thousand; upon that cadastral survey the 6-inch map is based; it is reduced from the 25-inch survey. From the 6-inch map the 1-inch map is reduced; so that you have one department carrying on the triangulation, the cadastral survey, and the topographical survey of the Kingdom on the 1-inch scale; consequently in this country you cannot commence the topographical map until the complete and scientifically accurate survey on the larger scale has been made. That is the system that has been approved and followed in Great Britain and Ireland, and has been laid down by the various committees and commissions, but it is quite different from the system on the Continent and in India. On the Continent and in India the survey is usually carried out by three departments. There are, the department which conducts the triangulation, another department which is charged with the *cadastre*, and another department which is charged with the topographical survey of the Kingdom. In India the distinction is the

Col.
Sir C. Wilson,
K.C.B., &c.

10 May 1892.

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Sir C. Wilson,
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10 May 1892.

trigonometrical survey, the revenue survey, and the topographical survey. The great difference between our system and foreign systems is that the *cadastre* in all foreign countries is made locally and has the defects of our old tithe maps, upon which two millions of money was spent, and I might say almost wasted, as the maps are now practically useless.

94. Do they not use the triangulation for the *cadastre*?—The triangulation for their *cadastre* is a local triangulation; it is not based on a "Principal" triangulation. The cadastral maps are not published except in rare cases. In Austria they are now publishing some sheets, in Wurtemberg and Bavaria they have also published cadastral maps, but I do not think, except in a few instances, they have published any in France. The "Principal" triangulation of France consisted originally of two belts of triangles carried from north to south for the measurement of an arc, and from these belts the triangulation was extended over the whole of the country. They are now re-observing their great triangles. In Germany something of the same kind occurred, the great triangulation was later than the *cadastre*. Then the topographical survey in foreign countries is carried out by an entirely different department; they have what are called plane-table sheets, upon which the trigonometrical points and detail reduced from the cadastral maps are laid down. The plane-table sheets are then corrected and completed in the field. Thus the topographical survey is carried out as a distinct service from the cadastral survey, and the latter independently of the trigonometrical survey. The trigonometrical points used by the topographical survey are supplied by the Trigonometrical Department. The great difference between our system and the foreign system is in regard to the publication of the maps. You will see by the returns that one-fifth of the Survey Vote goes to publication, and we have an enormous number of plates and separate maps; that has a most important bearing upon the question of revision; for instance, we have in Great Britain no less than 52,800 different plans of the 25-inch map alone, and the number is continually increasing from the survey of Lancashire and Yorkshire and Ireland.

95. By plans you mean paper sheets, not copper-plates?—Not copper-plates, but separate published plans.

96. (Mr. Mather.) Sheets?—Yes, sheets. Of the 6-inch map we have 3,657 engraved copper-plates in addition to 5,800 photo-zincographed quarter-sheets, making a total of 9,457 plates kept of the 6-inch.

97. Those include the old copper-plates so beautifully engraved?—Yes. Then of the towns we have no less than 12,000 sheets. The new map of London alone will contain 752 sheets, a larger number than the new map now being published of the Austrian Empire on the 1/75,000-scale will contain. The publication question is really at the root of the revision question, the difficulty and expense of revising and re-publishing this enormous number of sheets.

98. How many 1-inch plates are there?—The number of new series outline plates at present is 282, viz., 236 engraved and 46 photo-zincographed. The hill-plates are in addition. If you will allow me, I will hand in this return:—

NUMBER (approximate) of SHEETS published on each SCALE for ENGLAND AND WALES, SCOTLAND, AND IRELAND up to 14th April 1892.

	England and Wales.	Scotland.	Ireland.
1/500 and 1/625	10,107	892	937
1/1000	1,355	147	422
1/2500	43,605	9,244	865
6-inch { Sheets	1,616	2,041	1,907
{ Quarter-sheets	5,839	—	—
{ Sheets	1	—	—
Tithe Index { Quarter-sheets	132	—	—
1-inch:—			
Old Series { Sheets	53	—	—
{ Quarter-sheets	140	—	—
{ Sheets	1	—	—
New Series { Hills { Quarter-sheets	79* 1†	—	—
{ Sheets	2	—	—
{ Outline { Quarter-sheets	236* 46†	—	—
{ Hills	—	116	6
{ Outline	—	131	—
Sheets { Hills	—	—	191
{ Outline	—	—	295
Quarter-sheets { Hills	—	—	38
{ Outline	—	—	210
Indexes { Large	75	33	—
{ Small	6,918	983	—
Total	70,274	13,688	4,781

* Engraved.

† Photo.

99. (Chairman.) Would you recommend the separation of the publication from the map drawing and making department?—I do not think that would work well; it would lead to increased cost in the production of the maps.

100. We think our English system is the better one?—I think our English system is a slower one, but it is a better one in the end.

101. (Lieut.-Gen. Cooke.) I think one of the principal points which you mean to draw attention to is that in various countries the public are not supplied with copies of any scale except the topographical map, of about 1 inch to the mile, whereas in England they are supplied with copies not only of the topographical map of about 1 inch to a mile, but also with copies of the 6-inch and the 25-inch map; is not that one of the points?—Yes, that is one of the points.

102. (Mr. Mather.) Then on that point I understand you, Sir Charles, that the French system, for instance, is not so accurate as ours; they do not begin at the very bottom, on the same scientific basis that we do?—They do not begin on the same scientific basis.

103. (Mr. Brickdale.) I presume some of the local maps would not fit with the adjoining local maps if they are made locally?—I do not think they can be better than our tithe maps, and I know that the tithe maps of adjoining parishes do not always fit.

104. (Mr. Mather.) The topographical map and the cadastral map would not fit exactly the one with the other if they came to be fitted?—Not perfectly accurately.

105. Not so accurately as our maps are between 6 and 1 inch, for instance?—No, certainly not.

106. (Chairman.) And that is really a process which is actually adopted in France and in Germany, and in India, too?—In India to some extent. But I should like to say that foreign maps are perfectly accurate for all practical purposes; it was merely the difference of system that I wished to explain.

107. (Mr. Roby.) And then this great difference with regard to publication, that in fact abroad the large scales are only kept in manuscript. Here, both our large scales and our small scales are published?—Yes; and abroad copies of the manuscript plan can be obtained on payment.

108. (Chairman.) What department would give it to you?

109. (Mr. Roby.) I do not know. I wanted a 6-inch map for a part of the north of France; they had not anything of the kind; but you could get it for a small expense from whatever is their corresponding department.

110. (Chairman.) Just as you could get a bit of tithe map by employing a local surveyor to copy it, you could always get a copy of the outline cadastral map by applying to the proper departments. Is that a national department or communal department?—I think nearly every country has a central department to which the plans are sent, the Commune keeping a copy; but I am not quite certain. The Austrian Government, who are now beginning to publish their cadastral maps, have a remarkable system. They first publish the map with hardly anything on it except the enclosures, and then charge a fee for everything additional which is put upon it; if you have the boundary of your holding coloured they charge so much, if you have the trees and water inserted they charge so much more, for every additional detail they charge a fee, and if the plan is revised, they also charge for the revision.

111. Is the information which you require put on, kept ready on plates of some kind, or is it put on by hand?—It is put on by hand. I have a copy of an Austrian cadastral map here.

112. The triangulation of France is not yet completed?—It is completed. They have been re-observing their great triangles lately with the more perfect instruments of the present day.

113. And of Germany?—Germany is completed.

114. Is Switzerland completely triangulated?—Yes.

115. (Mr. Roby.) Italy?—I do not think Italy is.

116. (Lieut.-Gen. Cooke.) May I ask one question. Great complaints are often made as to the delay in publishing the 1-inch map. Now, I think, the statement that you have made as to the difference of the methods of England and the Continent will explain

why the publication of the 1-inch map must be deferred for so very much longer a time than it would be on the Continent; was not that one of the things that you wanted to bring out?—Yes. Our order is to produce the 1-inch map from the cadastral map.

117. And, therefore, the whole process of the cadastral map must be completed before you can bring out the 1-inch map; whereas on the Continent it is brought out as a different map?—It is brought out as a different map. I forget whether I mentioned that the topographical maps are very carefully examined on the ground by all countries.

118. The French and Austrian maps are very carefully gone over on the ground?—Yes, they are all examined on the ground before publication.

119. (Mr. Roby.) That is the same with your own maps—the English maps?—Yes.

120. (Chairman.) Can you give a definition of a cadastral plan?—A plan from which the area of land may be computed, and from which its revenue may be valued.

121. (Lieut.-Gen. Cooke.) And this term is applied to the 25-inch map of Great Britain?—Yes.

122. (Chairman.) The French explanation of the word is this: The area of a plot of ground is first ascertained, and then a valuation for purposes of taxation is placed upon it. These two operations, when entered in a book, constitute what is called the cadastre, and the map which accompanies and is referred to in the book is the cadastral map.

123. (Mr. Mather.) It is not possible to invent any English word that will carry out that idea?—I am afraid not.

124. (Chairman.) Is there anything more that you would wish to tell us?—That is all I have to say; I wanted to draw attention to the difference of system prevailing in our own and foreign countries.

125. You would say that our English system was a more accurate system?—It is more accurate scientifically; the other system is accurate for all practical purposes.

126. You have said that their system is more rapid, but I do not see why that is necessarily the case, because theirs is founded upon local surveys as ours is founded upon local surveys; only with us the same persons who make the great survey also make the local survey?—Yes.

127. While in France and other countries those who make the topographical survey make use of materials accumulated by other persons in order to complete their map?—Yes, to a great extent.

128. Why should that lead to greater speed on the part of the foreigner?—Because their cadastral survey was completed just as our tithe maps were; they are local maps. If we had produced a 1-inch map from the tithe map it would have been published long ago.

129. Because we should have made use of materials that were already available?—Yes.

130. So that if you were to start a country in which there was no survey, our system would be quite as rapid as their system?—Yes.

131. How is it that it should not be as rapid as in India; because, I suppose, there has been no survey there, except the Government survey?—In India the system is different; there are the Trigonometrical, the Topographical, and the Revenue Surveys under a Surveyor General.

132. But they have a topographical map proceeding there independently of the Revenue survey?—Independently of the Revenue survey.

133. Then that is a complete survey of the country by the Government?—That is a complete topographical survey; but it is not finished.

134. You would say that a topographical survey independently of a cadastral survey, can be made more rapidly than a topographical survey which is dependent upon a cadastral survey?—Yes.

135. (Sir A. Geikie.) The scale of that Indian map is comparatively small?—The topographical map?

136. The topographical map, yes?—The "Indian Atlas" is 4 miles to an inch; the sheets of the topographical survey 1 mile to the inch.

137. (Chairman.) There has been no revision, Sir Charles, of our old 1-inch map?—The 1-inch map has never been revised, but new railways have been inserted.

138. Not for roads at all?—Not for roads.

139. Nor for any other alterations?—Nor for any other alterations.

140. Not as regards the boundaries of towns?—In one case in which we have published a special map of the vicinity of Brighton we have revised the town for the 1-inch scale.

141. Such a town as Hastings or Eastbourne; Eastbourne has almost come into existence since the publication of the 1-inch map?—We have not revised any of the 1-inch maps, with that exception. There has been so much pressure upon the department to complete the 1-inch map over the whole country that we have never been able to devote time or money to the revision of the 1-inch published sheets.

142. Some of the old 1-inch map is very good, or was very good?—Some of the old 1-inch map is extremely good, and some of it is extremely bad. A great part of Devonshire, for instance, was sketched by contract during the old French war, and you can hardly recognise the hill features in some places.

143. That remark would apply to Exmoor?—That part of the country.

144. Is there any other part equally bad with that?—No; I think Devonshire and Dorsetshire are the worst.

145. Should not those portions of the country where the old 1-inch map is so bad be the first to secure the advantage of the new 1-inch?—We could not commence that district until the cadastral survey was completed.

146. But you have got the cadastral survey now?—Now we have, and that district will soon be engraved.

147. In making your progress with the new 1-inch map, are you proceeding continuously or are you jumping about England to places which most require it?—I have a diagram showing the programme for the publication. The 1-inch map followed the cadastral survey, and this index shows the dates upon which the sheets will be published up to the completion of the 1-inch map.

147-8. By 1896 you expect to get the whole of the 1-inch map published?—In outline.

149. The whole of the new 1-inch?—The whole of the new 1-inch.

150. And you have now completed the publication Northumberland, Cumberland, Westmoreland, Lancashire and Yorkshire, except a strip from east to west?—Yes, excepting a strip of South Lancashire and South Yorkshire.

151. (Mr. Roby.) What is the date of the survey on which the Northumberland 1-inch, which you call the new series 1-inch, is based?—1856-64.

152. (Mr. Mather.) And the publication of the first sheet took place in 1874. I understood you to say?—That was the new 1-inch ordered by the Treasury; the six northern counties were published much earlier.

153. (Mr. Roby.) Let me be quite clear about that. Northumberland and Cumberland, the new series of 1-inch maps, are they based upon the 25-inch survey or on the 6-inch survey?—The 25-inch survey.

154. The 25-inch survey would not be so old as 1846?—It is not as old as that; it is nearly 40 years old.

155. Taking, for instance, such parts as Worcester-shire and Herefordshire of the 1-inch map at present in use, can you tell me the date of the survey; that would be old series?—It is about 80 years old.

156. (Chairman.) I think we might have a table of the original survey of all the counties?—I will have one prepared. (See Appendix V.)

157. (Chairman.) This new 1-inch map is expected to be completed in the year 1896, by, I suppose, the process of photo-zincography?—By engraving.

158. You have permission from the Treasury to hasten the publication of this by photo-zincography?—By photo-zincography; a reduction from the 6-inch and 25-inch maps.

159. And making use of that process, how soon do you expect to cover England with your map?—With the exception of South Lancashire and South York-

Col.
Sir C. Wilson,
K.C.B., &c.

10 May 1892.

Col.
C. Wilson,
K.C.B., &c.
0 May 1892.

shire, which cannot be taken up until the cadastral survey is finished, I hope the whole of England will be finished this year by engraving or photo-zincography.

160. Will that be with hills or in outline?—In outline.

161. The Treasury permission gives with hills?—That is to be completed by 1900.

162. (Mr. Roby.) With hills engraved?—No.

163. With hills by photo-zincography?—Photo-zincography.

164. And the hills will be completed in 1900?—By photo-zincography. We were authorised by the Treasury to publish the sheets that could not be engraved by the end of that year by photo-zincography.

165. (Mr. Roby.) When may we hope to get the new 1-inch map of the south of Lancashire?—That will be the last to be taken up, I am sorry to say; it is by far the heaviest work, and we cannot commence it until the cadastral survey is finished.

166. Exactly; but when will that be?—It is not easy to say. The town surveys have kept us back.

167. (Chairman.) The special series of towns are delaying your completion of the cadastral map?—They are delaying the completion of the cadastral map.

168. (Mr. Roby.) May I assume that at present progress we are not likely to see the 1-inch map of the south of Lancashire based on the new revision before the end of this century?—By 1896, engraved.

169. (Mr. Primrose.) Is the engraved map very superior to the photo-zincographic map?—Yes; you cannot compare them.

170. (Mr. Mather.) I understand, Sir Charles, that even at the date you have named for the completion of these 1-inch maps, when issued, the sheets will not contain the information up to date about each locality?—The 1-inch map will show the country as it existed at the date of the survey.

171. And that may be many years before?—In some counties it will be many years old.

172. Take that part of the country mentioned by Mr. Roby—South Lancashire—what do you suppose we might anticipate with reference to that locality; would the information be very old that you would have upon the map?—The map that will be published in 1896 will give the result of the survey that is now being made.

173. So that you may say within five or six years we will get that?—In about four years.

174. (Mr. Roby.) In four years we may look for an outline map of South Lancashire engraved from the new survey?—Engraved from the new survey.

175. And Yorkshire will have been done before that?—The 1-inch plates of North Lancashire and North Yorkshire will be revised from the new survey.

176. And South Yorkshire will precede South Lancashire?—South Lancashire and South Yorkshire will be published from the survey which is now being made; North Lancashire and North Yorkshire will be revised from the survey.

177. (Chairman.) How is it that the towns get the preference to the regular work?—That is not quite accurate, the delay has been due to the enormous quantity of town work. The area surveyed on the town scale, 1/500, in South Lancashire and Yorkshire is very much larger than anything that we have experienced in other parts of the country; and though we have been, as I consider, fairly liberal with regard to the town plans, we have at the present moment requisitions from 37 towns in Lancashire and Yorkshire, either for surveys of towns which were not entitled to the 1/500 scale or for large extensions of surveys.

178. (Mr. Roby.) What is your definition of a town for a survey on the 1/500 scale?—The Treasury definition is a town of 4,000 inhabitants, but when the Treasury gave that definition the towns were compact. Now all the large towns are surrounded by an extensive area of villa residences which are extremely difficult and expensive to survey, and it is not easy to say where town ends and country begins.

179. (Chairman.) Is there any local contribution to that large scale survey?—In the case of several towns we have considered that certain areas ought not to be surveyed on the 1/500 scale at the public cost; but the towns wishing to have that scale have made a contribution, and we have then surveyed the areas for them.

180. When you survey for them on this large scale you also make your 25-inch map; you make your smaller map from the large-scale survey; you begin with your large scale?—Yes; the system we always adopt is this,—the officer in whose division the town lies is sent to the town to make a report upon the area which he thinks ought to be surveyed upon the large scale, and he is directed, if possible, to come to an agreement with the borough or city surveyor as to the area. If there is any difference of opinion between the borough surveyor and the division officer the question is referred to me. I define the area, and if the town still considers that the limits have been cut too short, reference is made to the President of the Board of Agriculture.

181. In your opinion, would it be better to complete the whole survey without waiting for the towns, or would you allow the survey of these towns to delay the completion of the survey?—It is rather a difficult question. My opinion is that the towns have rather had the advantage of the agricultural districts.

182. It would be rather to the interest of the country at large to have the whole map completed, than to wait for the completion of the towns?—The calculation is that for every acre of town land we can survey 20 acres of agricultural country.

183. The band of green that is marked upon that map, which shows a tract of country through South Lancashire and South Yorkshire, contains a very large population?—It is the most thickly populated portion of England, I believe.

184. So that the thinly populated portions of the country, which are not actually towns, are suffering in consequence of the very large requirements of the towns which are adjacent to them?—To a certain extent they are.

185. In fact that band of green represents a district of England which is likely badly to require a map?—Yes; I should like, with regard to the engraving of the 1-inch map, to say that I have had a return made out showing the very great advance in the progress directly the cadastral map was finished; for instance during the five years from 1882 to 1886, that was before the cadastral map became available, there were 6,259 square miles in outline engraved.

186. (Witness continuing.) From 1887 to 1891, when large areas of the cadastral survey began to be available, there were engraved 22,160 square miles—

187. Showing an enormous increase in pace?—Directly the cadastral survey became available; the rate we are now working at is an average of about 5,300 square miles a year, and we shall keep that up till we finish the map.

188. That is engraving?—Engraving.

189. (Mr. Roby.) And that is engraving without hill-shading?—Without hill-shading.

190. (Chairman.) The hill-shading has been added as it has been drawn?—It has been added as it has been drawn.

191. (Mr. Roby.) You are not adding much to it just now?—We have several engravers at work on the hill-map.

192. Of the new survey?—The whole force of the engravers has been employed on Scotland; now Scotland is nearly finished they are taking up England.

193. Are those who do the hill-shading different person from those who do the other part?—The hill engraving is very artistic work; it is extremely difficult to get men to engrave hills.

194. And, of course, all this hill country has to be gone over by skilled surveyors who can draw the hills first of all for the engraver?—The hills are drawn first of all on the ground, and then they are engraved in the office.

195. Is the drawing of the hills in a forward state?—It is very much in advance of the engraving.

196. And the staff for doing that can get on faster than the engravers?—Yes.

197. (Mr. Mather.) They are still ahead?—Very much ahead.

198. Want of engravers or difficulty in finding engravers is not dependent on money at all, but simply that they do not exist?—I do not think it is dependent upon money. A very small proportion of the engravers can engrave hills; we have tried all we could to get hill engravers.

See p. 227-8.

199. (*Mr. Roby.*) I suppose you could get more in the course of a couple of years by training a number of men for it?—Our engravers have had instructions to obtain as many as they could through their acquaintances or friends.

200. (*Mr. Mather.*) Do you employ any foreign workmen—French or German—on that work?—No.

201. (*Chairman.*) Do you know how many men you have competent to engrave hills?—16 altogether; six of them are employed on the Irish map.

202. (*Mr. Roby.*) And the others mainly in Scotland?—In England, excepting two. I should like to mention with regard to the question of expediting the publication of the 1-inch hill-map that I have considered the processes adopted in foreign countries. There are two good processes. One is the process of heliogravure; in that the hills are drawn in ink on paper; they are then photographed, and from the photograph a copper-plate is produced. I went very thoroughly into the question, and an officer of the Survey visited several of the foreign establishments. I found that in Austria, where the process is largely used—and the chief of the Cartographical Section of the Prussian Survey, who was at Southampton a short time ago, told me the same—it took a long time to train draughtsmen to make the drawings. They calculate that it takes nearly two years to train a really good draughtsman, that a very small proportion of the men trained are able to draw the originals, and that when they are fully trained they take 10 months to draw a sheet—to draw the original. I made a calculation, and I found that if we were to adopt the process we should have to take away the draughtsmen who are now employed in preparing the hill drawings for the engravers, and that it would not advance the publication of the map to any great extent.

203. (*Chairman.*) Is it as difficult to get draftsmen as it is to get engravers?—It is as difficult; it takes 10 months to draw a sheet for the heliogravure process, and it takes about 14 or 15 to engrave one of the 1-inch sheets.

204. At the present time the hill-shading is done by brush-work in part, I suppose?—The hills are drawn in pen and ink in the field. The pen-and-ink sketch is re-drawn in brush-work by very highly skilled draughtsmen in the office, and the engraver works from the brush drawings.

205. And the pen-and-ink work has, of course, to be practically repeated as an engraving?—It is done on a different system.

206. (*Lieut.-Gen. Cooke.*) It is a different scale, is it not?—It is a different scale.

207. (*Sir A. Geikie.*) It is done on the 6-inch scale?—All the country that is likely to be used for camps or to be the scene of operations in the case of invasion is sketched on the 6-inch scale, and the other portions of the country are sketched on the 2-inch scale.

208. (*Mr. Primrose.*) From what General Cooke said just now an outline map sells better than a map with hills in it. I suppose the outline map really for practical purposes is the important one; the other is more artistic?—The outline map is used for a great variety of purposes.

209. Then when we talk of expediting the map, the expediting of the outline map is for practical purposes more important than the expediting of the map with hills engraved?—Certainly, judging by the sale of the map.

210. (*Chairman.*) Will you or will you not resort to zincography for hills on the small map?—The Treasury has authorised an advance edition with hills to be published by photo-zincography, and we are drawing the hills and photo-zincographing them, but we have found some difficulty because the best draughtsmen must be employed on the work for the engravers.

211. Have you done any of it?—I think one sheet has been published (*a sheet is produced with hills photo-zincographed*).

212. Does it satisfy you?—It is a good map for all practical purposes; it is not an artistic map.

213. (*Chairman.*) Do you think that the public consider that the shading confuses the letterpress?—I think that the large number of sheets sold without hills as compared with the number of sheets sold with hills is due to the very large use that is made of the 1-inch in outline for what I might call admini-

strative purposes for colouring boundaries, &c.; I think it is very largely used, and it is a better map for a variety of purposes than the hill map.

214. For a traveller's purpose a hill-shaded map is better?—I think the hill-shaded map as a mounted map for giving a picture of the country is excellent; but I do not know that it is better for a man on a bicycle; for a pedestrian in the hilly districts, it is certainly better. These are a few of our latest sheets mounted together; the map gives a very good picture of the country.

215. (*Mr. Roby.*) This is the new survey?—This is the new hill map.

216-7. (*Sir A. Geikie.*) It makes a beautiful diagram, a sort of model of the country?—For hanging up on a wall; the great test is the joining of the sheets.

218. Within what time do you think you could complete the 1-inch hill-shaded map?—About three years ago I estimated that it would be completed in 1925, but by arrangements made since I think the date can be brought down to 1910—if we can engage more hill engravers, it will be expedited—but my latest calculation is that we shall finish the whole of the hill map in 18 years from the present time; that would be 1910.

219. With regard to what you said, Sir Charles, a little time ago as to completing the whole of the hill-shading by 1910, if you can get more hill engravers?—It can be completed in less time.

220. Do you not think, if efforts be made, more hill engravers would be found?—We have been trying to find them, but have failed to do so.

221. (*Chairman.*) I see in 1862, in the Committee of that year, it was said by the Director-General that the revision would cost 10,000*l.* a year, and then you would get a revision every 14 years of the whole of England. Now, last year it was stated by Mr. Roby, in his speech in the House of Commons, that it would cost a very large sum indeed, I forget the exact words that were used. Do you, Sir Charles Wilson, agree with Sir Henry James that if you had 10,000*l.* a year, you could keep the revision so that every part of your map should be revised once in 14 years?—It is a difficult question, and I can hardly answer it without explanation. I may mention that the Directors of the Survey, from the commencement, have been very sensible of the necessity for revision. It has been mentioned in the annual reports that have been presented to Parliament, and in other papers sent forward by the Directors. One Director, Colonel Colby, a well-known man, went so far as to say that if the maps were not periodically revised it would be better not to make a large-scale survey at all. When Sir Henry James made his estimate it was, I have no doubt, framed under the supposition that the revision would be taken up at once and carried out as the plans were made. At present the revision of the country has in many places fallen so far into arrear that there will have to be practically a new survey. I may mention one place that we have examined recently, that is Tyneside. Tyneside has grown enormously since the original survey, and the whole of the district will have to be re-surveyed. If the revision had been taken up at the proper time, that re-survey would not now be necessary. I calculated last year that to bring the cadastral map of the whole country up to a point at which no survey of any part of the country would be older than 15 years, would cost about 550,000*l.*; and would take 10 years from that date. No portion of the country would then have a survey older than 15 years.

222. (*Mr. Roby.*) That is to say, in 10 years you would have spent 550,000*l.* in addition to the present expenditure?—In addition to the present Ordnance Survey Vote. That would bring the whole country up to what is called the 15-year limit.

223. That would be an expense of about 260,000*l.* or 270,000*l.* a year?—I think about that.

224. It is 215,000*l.* or 216,000*l.* now, and adding 55,000*l.* it would be 260,000*l.* or 270,000*l.* a year?—Yes, that would be about it. When the survey was once brought up to the 15-year limit, there would be very little difficulty in carrying on the revision. The great difficulty would be the publication of the revised plans.

225. (*Mr. Mather.*) When you had got your revision, you would at once proceed to alter your large 25-inch sheets?—Every 25-inch sheet would have to be revised, and the stock in hand at the present time would have to be condemned.

Col.
Sir C. Wilson,
K.C.B., &c.

10 May 1892.

Col.
Sir C. Wilson,
K.C.B., &c.

10 May 1892.

226. Destroyed?—Destroyed.

227. (Mr. Roby.) And every 6-inch also?—And every 6-inch also.

228. And every 1-inch?—The impressions of the 1-inch scale would be destroyed, but the 1-inch plates would not be re-engraved; they would be corrected.

229. But I understand, that if you could get this additional 55,000*l.* a year for 10 years, you calculate that at the end of that period you would have the whole survey brought up to within a 15-years limit?—Yes.

230. And published?—I am afraid the publication would be a little later.

231. How much later?—I should say two years.

232. (Chairman.) You would revise the survey in the field; you would then alter your 25-inch M.S. plans and re-publish by zincography?—Yes, or photo-zincography.

233. You would then have to put that before the camera, and photograph it down for a new sheet for your 6-inch?—Yes.

234. And you would not reduce it by photography for your 1-inch, but you would alter your 1-inch engraved plates?—We should alter our 1-inch plates.

235. Is the 6-inch a plate?—A portion of the 6-inch is on engraved plates. We should correct those instead of engraving new plates.

236. A large quantity of the 6-inch maps are not produced from copper plates at all?—A large portion are produced by the photo-zincographic process.

237. (Mr. Roby.) As I understand, Sir Charles considers he would be able to produce new maps on the 25-inch scale, and corrected ones on the 6-inch and 1-inch?—We should have to produce new maps of the towns, and on the 25-inch scale, and we should correct the plates of the 6-inch and the 1-inch maps.

238. (Chairman.) And over a large part of England you would not require an absolutely new map. Tyne-side, you say, would require an actual re-survey in every detail probably?—An actual re-survey in every respect.

239. But as regards a large part of the country, the correction of a few field fences here and there would bring the thing right?—Yes, in the agricultural districts that would be so. If you will allow me, I will explain the scheme that I have always proposed to carry out, if the revision of the country were once brought up to a normal condition. I would propose, first of all, that the revision of the 1-inch map should be entirely distinct. We have never been able to take up the revision of the 1-inch because our men have been employed in bringing out new 1-inch sheets, but I would propose to separate the revision of the 1-inch map from that of the cadastral map, and to carry it out as a separate work. The new roads and railroads, and the environs of growing towns should be placed on the 1-inch map as soon as possible.

240. (Mr. Roby.) The revision of the 1-inch, say, for instance, in Worcestershire and Yorkshire, would that be a new map reduced from the 6-inch, or would it be merely the revision of the old survey?—It would be a separate revision of the new 1-inch map, reduced from the 25-inch survey. For instance, I would propose to revise the sheets of the south-east of England, which have been published for some time, on the 1-inch scale; and not to wait until the cadastral survey of that portion of the country had been revised.

241. Then what would you do as regards Worcestershire, which exists only in the old series?—That will be published in the new series this year.

Then, with regard to the cadastral survey and the town surveys, I have gradually moved the Divisions of the Survey into positions which I hope will be permanent, and to each of those divisions I would propose to assign a certain district; then, if the survey were ever brought up to the normal limit, I would propose issuing a circular to all town and city surveyors requesting them to communicate any large improvements or additions to their towns to the officer in charge of the division in which their particular town lies. By that means we should know where great changes had taken place, and the Division officer would carry out the revisions whenever it was possible and with due regard to the amount of money placed at his disposal.

242. (Chairman.) Now, you have said you want 55,000*l.* a year to revise the whole survey; supposing

you divided that estimate into two portions, one for the 1-inch map, separately revising that as you suggested, and the other for the revision of the cadastral, how much do you think you would require for the separate revision of the 1-inch map?—The revision of the 1-inch map would not be nearly so heavy as people generally imagine. In the beginning of this year the General Officer Commanding at Chatham asked that the 1-inch map of the Chatham district should be specially revised for military purposes. We sent men to revise the map on the ground, and we found that the additions that should appear on the 1-inch map were not nearly so numerous as we had expected; there were not nearly so many new roads or changes as we had expected to find.

243. You think it would be very desirable at once then to start a revision of the 1-inch map, so as to prevent that getting into arrears?—We should have started it before if we could have found engravers to carry out the corrections on the plates; but every engraver has been employed on the new 1-inch map: that has been the difficulty.

244. (Lieut.-Gen. Cooke.) As you are going to give the public by the end of the present year a complete 1-inch map by zincography, which for practical purposes is quite as useful as the engraved map, though it is not so ornamental, would it not be well to delay the engraving of the 1-inch sheets until they can be based on the revised survey, and then the engravers could be employed in revising those sheets which are already based on the new survey, but which are getting obsolete; is it not a pity to be engraving the 1-inch sheets upon information which is, we will say, 20 years old, and not to wait till you get that information revised, as that supplies the public with all the data they want for practical purposes?—I think the sheets we are engraving now are all from the more recent surveys, none older than five or six years; all this part of the country was surveyed last.

245. Not more than five or six years?—Devonshire, unfortunately, was the last county surveyed on the cadastral scale, and that accounts for the delay in completing the 1-inch map of that county.

246-7. (Chairman.) So that all the western half of England when it comes out in the 1-inch map will not be 10 years old?—No, it will be fairly up to date.

248. You say hill engravers are very difficult to get; would it not be possible to increase your staff?—We find great difficulty in getting men who can work up to our standard. Some engravers we have taken on from Birmingham are good men, but not so good as those who have been trained on the Survey.

249. The real difficulty is not a money difficulty, but a technical difficulty?—Engraving is dying out as an art, the cheap processes having to a great extent supplanted it.

250. (Mr. Roby.) Could you do the hill-shading in another way, both satisfactory and more expeditious?—The saving of time would be very small, and on the other hand you would have a portion of the country published in one style, and a portion in another; the saving of time would not be sufficient to compensate for that.

251. Would you give me an idea of the time it takes from your survey of the country, on the 25-inch scale, to the publication of a 1-inch map, supposing you proceeded straight; is it a matter of a year or three years?—More than that.

252. Could it not be done in less?—I do not think we have ever been able to work continuously from the 25-inch to the 1-inch on account of the patchwork way in which the 25-inch survey was taken up.

253. Quite so; but I assume that you had simply instructions to survey, say, one county, and to proceed at once to produce a 1-inch map; how long do you think that would be from the time you sent your men into the field, going straight on till you produced your 25-inch map?—I should think in four or five years.

254. It could not be done in less than that?—It might be done if one county alone were taken up.

255. I mean what the real necessary process is, suppose you devoted yourself to it?—If you took up a special district it would not take so long.

256. The real process would not take more than a year?—It takes more than a year to engrave a plate. To engrave a large hill-plate, from 18 months to two

years, and a small plate 14 or 15 months. I think one reason for the backward state of the survey in England is that people did not care much about it; the Scotch pressed for the completion of their survey.

257. (*Chairman.*) You mentioned about getting the town surveyors and persons to send you information; do you think the Ordnance Survey Department would derive any advantage supposing there were legislation, as in the case of the British Museum for the supply of copies of books, obliging town and county surveyors to send in reports to the Survey Office as to any alterations or improvements carried out in their districts?—I think it would be a great advantage. The only department from which we receive assistance at present is the Railway Department of the Board of Trade, who send us every year a return of railways that have been opened. As soon as we get this return we send men to survey the railways, and we then engrave them on the 1-inch map.

258. I suppose that would save you expense if you could have plans of railways supplied to you by the railway companies?—We should be able to insert them on the 1-inch map from railway maps.

259. You would put them on the 1-inch map, and would you not put them on the 25-inch map from their survey?—I should be disinclined to do that, because we are not only responsible for the accuracy of the survey but for the acreage of the parcels; and, if we adopted the survey of the railway company, and laid it down on our 25-inch map, the areas of the adjoining parcels would be altered, and we should be dependent on their survey for those areas.

260. Supposing they were required to show their railway on one of their 25-inch maps, do you think that would be so untrustworthy that you might not put it on?—I do not say it would be untrustworthy, but I should not like to issue it as an Ordnance Survey map without examining it.

261. You would probably send somebody down to the district?—I should send someone down to the district.

262. (*Mr. Roby.*) To examine the map?—To examine the map.

263. (*Chairman.*) That leads to a great deal of expenditure?—I do not think it is as large as you imagine; the number of new lines opened each year is not great.

264. I was rather thinking of extending it a little farther than railways, to alterations of roads, new streets that are constantly being made about towns, supposing the town surveyors and the country surveyors were under obligation to show on one of your 25-inch maps the alterations of which they had official cognizance. You think that would not be accurate enough for you to make use of?—I will not say that it would not be accurate, but I should not like to issue it as an Ordnance map, which has to be used for the registration of property.

265. (*Mr. Brickdale.*) I was going to say that for the registration of title that would be exactly what we should find quite sufficient?—A survey by the local surveyors?

266. If the local surveyors were to send in the plans of new streets made, we should be quite content for the registration of title to take that survey, and it would save applicants for registration a good deal of expense. Could we apply to you for a copy of that instead of having to send to survey the land?—Yes.

267. (*Mr. Roby.*) Might I ask, Sir Charles, how many divisions you were contemplating for the revision of the country?—We have eight divisions.

268. And it was really these eight divisions that you were thinking of establishing in permanent positions; are these eight in England?—Seven in England, and one in Scotland.

269. Ireland?—Ireland is treated as a distinct branch of the Survey.

270. Ireland is not conducted so much by you personally as England and Scotland?—Yes; but the survey is treated to a certain extent as a distinct work; the money devoted to it is shown separately in the Appropriation Table in the Estimates; all the officers are interchangeable between Ireland and England.

271. The map is produced on the same principles and in the same style?—There is no photography in Ireland.

272. What is the practical effect of that; are they slower in bringing the thing out?—We have only just commenced the publication of the 25-inch plans, and instead of having a separate photographic establishment in Ireland the plans are sent over to Southampton for reduction.

273. Then the map ultimately is produced in the same way, only the photographing portion of it is done in England?—Yes; except that the whole of the Irish 6-inch map is engraved.

274. (*Chairman.*) I dare say you have occasionally put on to your maps information supplied of alterations?—I do not remember a case at present.

275. I wrote a letter to Mr. Chaplin last year on this particular point, which was afterwards sent to Southampton, and I think you saw it, and I mentioned a case of my own where, having had the advantage of an advanced drawing from the office of a part of my estate, I made some small alterations, and thinking it rather a pity that your new map should be published without my alterations, I sent you a tracing of the alterations from my own map; I was rather pleased to see when you published your map that you published it with my corrections; whether you sent your own surveyor to see whether they were correct or not I do not know?—In cases of small corrections of that kind we adopt them if we think they are accurate.

276. And you use them without your own surveyor going?—Yes; it depends on the importance of the correction. For instance, we often have typical errors and errors in drawing pointed out to us; these we frequently correct.

277. (*Mr. Roby.*) Were those corrections you spoke of made on the 6-inch or the 25-inch?

278. (*Chairman.*) On the 25-inch, a cottage or two pulled down; a cottage or two built; a fence or two altered; and the published map came out with these alterations?—I could not say without inquiring whether anyone was sent down on that occasion; but we very often make small corrections when pointed out to us.

279. I spoke about this to Mr. Chaplin last year, with reference to the revision. I was rather anxious to see whether it was practical to carry it out on a large scale, and whether by legislation we could not oblige certain persons to send tracings upon the 25-inch map, showing alterations; whether the cost of the revision might not be largely diminished and the speed of it might not be immensely increased by such a method?—That is rather a difficult question. In the case of a city or town, if they had to supply us with all corrections, the cost of doing so would fall upon the local rates; and if we published these corrections, and any error were discovered it would lead to disputes as to the origin of the error, whether it lay with the town surveyors or with us. I think the most economical and the most satisfactory plan would be that I have suggested—that the city surveyors should let us know where great changes have taken place, and that we should revise once in four or five years, or according to the rapidity with which the town is growing.

280. You think, then, you would get no advantage from having in your office an actual sketch of what had happened every year?—I think it would be an advantage to us to know what changes were being made. I suggested that the city surveyors should let us know once a year what changes had taken place.

281. Do you think you could rely upon voluntary action?—It would be very much better if it were obligatory.

282. (*Mr. Roby.*) And the notice of improvements would take the shape probably of a correction of the map?—It might take the shape of a rough correction of the map.

283. If the trouble is taken to pass a Bill through Parliament it should take that form?—Yes; we should have great difficulty in finding out where changes had taken place if we did not get some assistance of that kind; we could not keep men travelling over England to find out where changes had taken place.

284. (*Chairman.*) That is of course one of the great difficulties, that you may travel over a great many acres and miles without finding any change at all?—Yes.

285. At present if you wish to revise your 25-inch maps, one of your surveyors has to go into every field which is shown upon his map in order to see if it

Col.
Sir C. Wilson,
K.C.B., &c.

10 May 1892.

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10 May 1892.

remains the same?—That would be carrying out a perfect revision of the cadastral map; we should have to go into every field.

286. That would be such a revision as you are contemplating for an expenditure of 55,000*l.* per annum?—Yes. I do not think the very great difficulty we have with regard to boundaries is generally realised; for instance, there has been a Scotch Boundary Commission; the decisions of that Boundary Commission have affected a very large number of the 25-inch sheets in Scotland, and the labour of carrying out the alterations on the plans will be something enormous. We have not commenced it yet.

287. What would be the nature of your alteration?—Alteration of parish boundaries.

288. Due to some judicial decision?—Due to the action of the Boundary Commission in Scotland.

289. (*Lieut.-Gen. Cooke.*) Simplifying parish boundaries?—In some cases they have simplified parish boundaries and in other cases they have altered both the county and the parish boundaries; it is not only that the boundaries on the map become obsolete, but the writing of the parish and the county names has to be altered.

290. (*Mr. Roby.*) And is this an alteration of the boundary for all purposes or only for certain county council purposes?—For all administrative purposes; it does not affect property boundaries.

291. (*Chairman.*) Now, very recently in Gloucestershire a new parish has been formed, and according to the provisions of the Act a map has been sent to Southampton showing the new parish boundary. It has been cut out of three other parishes. What will happen; will that be taken notice of?—We take notice of all boundaries, and when we can we revise them on our plans. Major Johnston has a copy of a sheet which will show you the extent of the alterations on one sheet. Not only has the boundary to be altered, but nearly every parcel in the parish has to be re-numbered, and where the new boundary crosses enclosures the parcels have to be recomputed.

292. Is the 25-inch map numbered by sheets or by parishes?—The parcels are numbered by parishes. There has always been a difficulty with regard to the numbering of the parcels. In Ireland the Valuation Department largely use the 6-inch sheet numbers. In England the Directors of the Survey have, once or twice, suggested that the parcels should be numbered by the 25-inch sheets, but that has always been opposed by the Land Office, who have held that the parcels should be numbered by parishes; thus, when the parish boundary is altered the whole of these numbers have to be altered also. If it were the custom in England to work by the sheet our practical difficulties would to a very great extent disappear. I think that example will show you better than anything what takes place.

293. Now that you print the area on the various plates do you also prepare an area book?—No.

294. That is done away with?—Yes.

295. That being the case, might it not be advantageous, as you no longer published an area book, to do away with the parish numbers on the Ordnance sheet?—The Land Department has always insisted that the numbering of the parcels by parishes is necessary.

296. The numbers are so very eccentric in their order on the sheets?—It would greatly simplify the work of the Survey if the parcels were numbered by the sheets, but that has always been opposed.

297. It would be a serious thing, I suppose, to give a direction that all the numbering should be by sheets and not by parishes; that would create an enormous amount of work?—The difficulty is that in dealings with land, especially in the country, the parcels have been to a large extent identified by the parish numbers, and if we were to change those numbers now, I am afraid there would be a good deal of confusion.

298. (*Lieut.-Gen. Cooke.*) It would affect deeds and all that sort of thing?—I do not think they are entered in deeds.

299. (*Mr. Brickdals.*) Sometimes they put them in.

Witness (continuing). The Irish system is a very perfect one. In Ireland the parcels are numbered by the Valuation Department on the 6-inch map from 1 to 300 or 400 or whatever it may be, and when the revision

of the valuation takes place, the subdivisions are simply numbered on the 6-inch sheets, as 1*a*, 1*b*, 1*c*, &c.; but you cannot do that with the alterations to parishes in England.

300. But if you numbered by the sheet, then it would not have upset the numbering?—It would not have upset the numbering.

301. And considering that every revision must alter the numbering, even if you number by parishes, it is impossible to regard these numbers as permanent?—The frequent alteration of the parish boundaries has made the numbers not permanent.

302. (*Mr. Roby.*) I do not quite understand why you should re-number the whole parish in consequence of some alteration. Supposing a plot is taken out of a parish; you need simply suppress that number; supposing a plot is added, you could add it; supposing a plot is subdivided, you could again subdivide your number and make it 129¹, 129², or whatever it is?—We do not alter the numbers when we can avoid it.

303. That seems to have been entirely re-numbered from top to bottom.

304. (*Secretary.*) That is owing to the parish boundary having been altered. These numbers are in a different parish to what they were before?—It has always been a question whether you should number by sheets or by parishes, and the Land Department has always insisted upon numbering by parishes. At one time the parish boundary was stable, but at present it is unstable, and the advantage of working by parishes is to a great extent lost.

305. (*Mr. Roby.*) Do you think that, as far as you know, your estimate of 55,000*l.* a year for 10 years could be really depended upon; have you taken in all probable contingencies?—As far as I know it can be depended upon.

306. Is the cost of survey or of engravers pretty stable, or has it been increasing lately?—The wages have increased during the last few years, and the actual cost of the work in Lancashire and Yorkshire has been higher than usual, but that is to a great extent due to the extremely difficult character of the country. In North Yorkshire and North Lancashire the cost per acre has not greatly increased, but in South Lancashire and South Yorkshire the cost has been very largely in excess of what we have been accustomed to.

307. And in those 10 years you think the revision might be completed, and in about a total of 12 years the results published?—Yes.

308. And engraved or photo-zincographed?—The large plans would be photo-zincographed. The 1-inch would be corrected on the engraved plates.

309. And, then, what do you think the cost of the revision would be; continually keeping the thing up so as never to be more than 15 years behind?—That is a difficult question to answer.

310. But it would not be so much as that, 55,000*l.*?—Between 50,000*l.* and 60,000*l.* altogether for the field work.

311. Do you think the bulk of the delay is due at all to the Ordnance Survey having undertaken a good many other things, such as facsimiles of Domesday Book and national manuscripts, and the survey of Sinai and Jerusalem?—I think not at all. The copying of the ancient manuscripts was stopped some years ago. It was entirely a photographic work and it did not interfere with the current duties.

312. I suppose the survey of Jerusalem and Sinai must have taken skilled men?—I carried out both surveys myself. The only assistance was that five men were lent by the Ordnance Survey, but they were paid from funds raised by subscription. They were struck off the Survey books, and their places were taken by other men. There was no expenditure from the Survey Vote on these services, except for the publication, which was not a very large matter.

313. And the progress of the English survey and publication was not delayed, you think, by those five men being taken away?—No; because their places were taken by other men paid out of the Survey Vote.

314. (*Lieut.-Gen. Cooke.*) Could you give us a statement showing how the money is expended now; the annual vote for different branches of the Survey; it is not in your report, so far as I see?—No; it was in that for 1888.

315. That would be before the cadastral survey was finished; it might be very different now?—You mean the appropriation of the money?

316. Yes; the appropriation of the money?—That is in the annual estimate.

317. (*Mr. Brickdale.*) The revision is the most important point for land registration. If the belt of land round the towns, of which the entire character and appearance and face is being changed by alteration, could be kept revised, even with only fair accuracy, it would meet all purposes of the Land Registry, and save applicants a great deal of incidental expense. Might there not be some record of new roads and the laying out of new estates kept at Southampton available for the purposes of the Registry?—If we were ever in a position to commence the revision—at present we are not in a position to do so, because the whole of the vote is devoted to the re-survey of the 6-inch counties on the 25-inch scale—we should naturally take up those districts.

318. Those very districts?—Round the towns; we should take those up at once.

319. And if a permanent scheme of revision were given, those would be the districts to which attention would be prominently given?—The scheme which I have in my mind, if revision were started on a proper basis, is to revise the towns once every five years and the agricultural districts once every 15 or 20 years.

320. That is the distinction we really want?—I feel certain that must be done.

321. It is a small matter to straighten a curve or put a new gate or cottage on a map of country land; but where the whole aspect of the place has been altered one must go to the lands and have a special survey to get even a small bit of land on to the register?—We should certainly devote our attention to those places. We find in North Lancashire and North Yorkshire that few changes have taken place, and those chiefly near towns. In some parts of Yorkshire small enclosures have been thrown into large ones, and the changes are simply the removal of fences. We have never been able to commence the revision, or what is really revision. The only place that we are revising now is Plymouth, and that is partly for War Department purposes.

322. And those local centres that you are establishing they, I suppose, might make themselves the depositories of information or plans of new roads, perhaps something rather less than actual surveys?—They could be the repository of documents of that kind. What I anticipate would happen would be that the city surveyor of Manchester, for instance, would every year send an Ordnance Survey plan, with the new streets or changes roughly indicated upon it to the division officer at Chester or Derby, and that those plans would remain in the office of the division until the officer considered that the amount of improvement or change was so great as to necessitate revision. One difficulty with regard to towns is, that the Ordnance Survey Department and borough and city surveyors look upon the large scale survey from an entirely different point of view. The borough and city surveyors often wish to have agricultural or partly agricultural lands surveyed on the large scale, so as to enable them to lay out lines of streets and buildings. On the other hand the Survey Department consider it a waste of money to publish a sheet that would be obsolete in a year or 18 months; and that the work of the Department is rather to survey streets and buildings after they have been made.

323. A local office in which plans could be deposited of all large improvements or laying out of estates would meet the purposes of the Land Registry perfectly, because then they could apply to the Ordnance Survey itself to give them a plan of a certain piece with a certain road and a certain plot filled in. That they could do?—That they could do.

324. At far less expense than going to the land to survey it?—Yes.

325. (*Mr. Roby.*) I think you said you would put Manchester in the Chester or Derby district. Why should you not make a large town like Manchester the head-quarters of the district?—We find that the smaller towns are cheaper, and that we have more control over the men; as a rule we avoid the large towns.

326. I should have thought in a place like Manchester you would have been much more able to get at the alterations which were going on?—Now every place is near; no part of the country is beyond a day's post.

327. How much a year in money is appropriated to Ireland. For instance, the cadastral survey, does that include Ireland?—The cadastral survey means, as regards Ireland, only the completion of the engraving of the 1-inch map.

328. And that revision of the Irish survey is really a survey on the 25-inch scale?—It was on the 6-inch scale; it is now on the 25-inch scale.

329. And this so-called revision of Great Britain really means the 25-inch survey for Lancashire and Yorkshire?—The 25-inch survey of Lancashire and Yorkshire.

330. No money, except for very isolated places like Plymouth, is expended on the revision of the great mass of published plans?—At present the Survey Department is under engagement to complete Lancashire and Yorkshire on the 25-inch scale, and to put the six Scotch counties on the 25-inch scale. No money is being spent on the revision of published plans excepting at Plymouth and Glasgow.

331. (*Chairman.*) In fact there is no hope of any revision of published plans for about 10 years or so?—I should say four or five years.

332. Until the Scotch counties are done?—Not until the Scotch counties are done.

333. Unless some alteration of procedure is ordered?—Yes.

The witness withdrew.

334. (*Chairman.*) I wrote a letter last year to Mr. Chaplin which I should like to put upon the notes. Immediately after the debate in the House of Commons I had some conversation with him, and I wrote him this letter. I will put it in as part of our proceedings:—

Board of Agriculture, 1st June 1891.

30, Queen Anne's Gate,
St. James's Park, S.W.,

MY DEAR MR. CHAPLIN, 29th May 1891.

THE debate to-day on the Ordnance Survey, and the statements made as to the great cost of constant revision which is necessary to keep the survey, when made, moderately up to date, has suggested an idea which I cannot help thinking is practicable and feasible, and would enormously reduce the cost, and render it possible to keep all the maps up to date, without the necessity of revision on the spot by officers of the Survey.

Some years ago I got a tracing from Southampton of one of their maps in advance of publication. I made some not very important alterations in fences, and thinking it a pity that a map should be published in a form which had become incorrect, I sent a tracing of their own map with my alterations marked on it back to the office. The map was subsequently issued as I had corrected it. I would suggest that what I did as an individual should be imposed by law as a duty on all public bodies having control over roads, works, and buildings or having judicial cognizance of changes in them as marked on the Ordnance maps.

No roads can be closed or can roads be substituted for other roads without the deposit of plans at the office of the clerk of the peace in each county.

No new road can become a public road within any local board or municipal area without plans coming before that body.

No railway or canal can be made without an Act of Parliament. Just as every publisher of a book is obliged to send copies to the British Museum and to Oxford and to Cambridge, so I would suggest that each authority of the above classes should be bound to send an altered 25-inch map to the Survey Department once in every year, showing all changes made with their sanction.

These bodies now, most of them, receive considerable Government subventions in aid of their local resources, and I see no reason why this obligation in the public interest should not be placed upon them. The trouble and cost to them would be slight. They all have surveyors, more or less efficient, in their service, and unless the works were very large, the chance of any appreciable error, if the drawing sent was made on an Ordnance sheet, would be very small. I would not push this obligation beyond the public bodies I have mentioned, but if it answered, as I think it would, it would not be difficult for the Survey Department to extend its operations through the voluntary assistance

Col.
Sir C. Wilson,
K.C.B., &c.

11 May 1892.

Col.
Sir C. Wilson,
K.C.B., &c.
10 May 1892.

of county and borough surveyors to changes in the face of the country of a less public character, such as the erection of buildings, the creation or abolition of parks, or making of private roads, and thus the maps, with very small personal inspection on the part of the Survey Department, might be kept pretty nearly correct. The information obtained would, I should think, be pigeon-holed by counties, and dealt with en bloc every four or five years, or as fast as the special class of employes could complete their cycle of revision.

A revision as now made requires the inspection of every sheet on the ground itself, in fact in every field, as no information is forthcoming.

Speaking as the head of the administration of a large county, I should feel no objection to having the above obligation cast upon us, nor would there be any difficulty in carrying it out.

Believe me, &c.
(Signed) JOHN E. DORINGTON.

Adjourned till 11th May at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

SECOND DAY.

Wednesday, 11th May 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BARONET, M.P., THE CHAIRMAN, PRESIDING.

Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. WILLIAM MATHER, M.P.

Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Sir CHARLES WILSON re-called and examined.

Col.
Sir C. Wilson,
K.C.B., &c.
11 May 1892.

335. (*Chairman.*) Before we go to the question of the policy of the maps, I think there were two questions that we should have asked yesterday with regard to revision. What additional staff would you require if the 1-inch map is to be revised continually? You suggested, you remember, that the revision might be advantageously divided into two parts, the more extensive belonging to the revision of the large-scale maps, and the smaller amount of money having reference to the small-scale maps, and that the two revisions should be kept separate. Could you tell us what additional staff or what additional expenditure you would require in order to keep up that 1-inch map revised as you suggest?—What I should propose to do would be to appropriate a portion of the Survey Vote to the revision of the 1-inch map.

336. Oh, you would not increase your estimate?—I would not increase my estimate.

337. You would cut down some other branch of the work then?—I would cut down some other branch of the work.

338. What branch of the work would you omit?—I would delay to a certain extent the completion of the survey of the 6-inch counties on the 25-inch scale.

339. You would check that work?—I would check that work in order to carry on the revision of the 1-inch map.

340. In fact you would propose this, that you would at once start the continuous revision of the 1-inch map without increasing the vote?—Without increasing the vote.

341. Simply turning the attention of a portion of your staff to that department?—Hitherto we have considered that the Survey Vote should first be applied to the production of 1/2500 maps of those portions of the country which were not already mapped on the 1/2500 scale; what I propose to do now is to apply a portion of the vote to the revision of the 1-inch map.

342. Do you think that would give satisfaction, entailing, as it would, delay in the completion of the cadastral survey?—It would not be a very heavy expense, as far as the field-work is concerned.

343. A couple of thousand pounds a year?—I do not think it would be more than that; practically we have done something of the same kind during the last four or

five years; we found that in the mechanical reduction from the large-scale to the 1-inch the draughtsmen frequently omitted detail which ought to be shown on the smaller scale, and during the last four or five years we have employed men to examine the 1-inch map on the ground on that scale.

344. So that what you are proposing is already partly provided for?—Partly provided for.

345. (*Mr. Roby.*) Will not the cadastral part of the Survey as regards England and Scotland be finished in three or four years?—I think in about five years.

346. Ireland may take longer, I suppose?—I could not say without reference, but I think about 25 years.

347. Twenty-five years?—For the cadastral survey.

348. Could you not by doubling the staff increase the rapidity of the thing?—You cannot increase the Survey staff at once, you must increase it by degrees as the men have to be trained; but the completion of the Irish survey on the 25-inch scale entirely depends upon the sum devoted to it.

349. (*Mr. Mather.*) I should like to know whether since yesterday you have calculated what time it will take to get the cadastral survey for Lancashire and Yorkshire completed; that is the only part remaining unfinished as far as England is concerned?—I cannot give you an exact answer without reference to Southampton, but I think it will be completed in two years.

350. (*Mr. Roby.*) And how much longer to complete Scotland?—Scotland will be about three years more, that is about five years altogether.

351. In about five years the cadastral survey of England and Scotland will be finished?—Yes.

352. At the present rate of expenditure?—Yes.

353. And in about 25 years at the present rate of expenditure the Irish cadastral survey will be finished?—I think in about 25 years.

354. At the end of five years then you would get all that money available which is now expended on the cadastral survey of England and Scotland?—Certainly.

355. (*Chairman.*) You estimated that the revision would cost about 55,000*l.* a year?—Yes.

356. (*Mr. Roby.*) The 55,000*l.* would be in addition to the present sum?—In addition to the present sum.

357. (*Mr. Brickdale.*) This expenditure would not be permanent, would it; that would bring the revision up to the 15 years' limit, and then the revision could go on at a much less rate?—After the country has once been brought up to the 15-year limit, the revision would be a comparatively small matter.

358. (*Mr. Roby.*) Could not you give us what the then cost of the Ordnance Survey would be after the cadastral survey is completed and after the revision is carried out in the way you suggest, so that no part of it should be behind more than 15 years?—I could have that calculated.

359. As I understand it in that case it would be all applied to revision and to publication?—Revision and publication.

360-1. (*Lieut.-Gen. Cooke.*) Would you make out a statement of the money granted this year and the way in which it is to be disposed of, and how the money is to be disposed of for the next ten years?—Yes. (*See Appendix C.*) If you will allow me I will read a paragraph from the report that I wrote in 1891 upon the subject; I think it would put it more concisely.

362. Yes?—"It has been estimated that the 25-inch maps of Great Britain might be brought to what may be called their normal state, viz., a state in which no map would represent a survey more than 15 years old, in 10 years' time for a sum of 552,000*l.*, in addition to an annual Survey Vote, equal to that for the current year. That is to say an annual survey vote of 271,000*l.* (216,000*l.* + 55,000*l.*) would be necessary for 10 years. It would not, however, be desirable to increase the staff of the Survey suddenly, and in order that men may be gradually trained to the duties of revision it is proposed that the Survey Vote should be fixed as follows for the next 10 years:—

	£	£	£
" 1892-93—	216,000 + 16,000	-	232,000
" 1893-94—	216,000 + 32,000	-	248,000
" 1894-95—	216,000 + 48,000	-	268,000
" 1895-96—	216,000 + 65,000	-	281,000
" 1896-97	216,000 + 65,000	-	281,000";
to			
" 1901-2			
six years			

and keep the 281,000*l.* until 1902, when the revision up to the 15-year limit would be complete.

363. Then you drop down?—After 1902 the revision staff would be reduced to its normal limits, and the men not wanted for this work might be employed on the 25-inch re-survey of Ireland.

364. (*Mr. Roby.*) At 1902 there would only be the cadastral survey of Ireland still going on; all the others would be finished?—All the others would be finished.

365. (*Mr. Mather.*) Are these figures, Sir Charles, based upon the assumption that Parliament would grant you any amount of money you like in order to complete the whole of the work connected with the Ordnance Survey in the shortest possible time; assuming you had *carte blanche*, and that Parliament demanded that these maps should be completed in their entirety up to the normal state of revision which would always have to go on, would that sum of money enable you to do that?—That would enable me to do that.

366. Are we to assume that 1902 is the earliest date at which, with all the resources that Parliament could place at your command, these maps could be completed in their entirety for the use of the public?—Yes, I think so.

367. Leaving the amounts of money out of the question, if your only problem was to get this work done in the shortest possible time with any expenditure—of course useful expenditure—could you reduce that time from 1902 to 1896 or 1897?—I do not think it could be reduced more than one year or at the most two years from the difficulty there would be in training men.

368. Would you like to reserve your opinion upon that for a little while and give us further information; because, at the end of our inquiry we shall probably have to put this question to ourselves; supposing Parliament were to decide to have this done, could it be done; we want to say to Parliament that the public are anxious to have these facilities in their hands, if it could be, to-morrow; could you consider the ques-

tion, and give us an answer later on?—I should like to consider that more carefully. The difficulty is to train men, and especially to obtain trained superintendents.

369. Would you kindly consider that and give us a report later on?—Yes, certainly.

370. (*Mr. Mather.*) It has not come out quite clearly, I think, whether, if extra money were allowed for the inch-scale map, the other work you are now pursuing could be continued in its present condition?—Certainly, it is a mere question of money.

371. A small addition, in fact, to what you are at present expending on the 1-inch scale map?—Yes.

372. How much has been done to the Irish cadastral survey?—That is given in the report.

373. Off-hand, is it very much?—It has only lately been commenced.

374. (*Chairman.*) What is the cost of this advanced 1-inch map; could you tell us that?—The sum given to us by the Treasury for completing the whole of the advance edition was 1,135*l.*

375. (*Lieut.-Gen. Cooke.*) That completes the 1-inch map?—In outline.

376. Does that include everything to do with this new 1-inch map, that is to say, putting it down on zinc, printing, and everything?—Everything except printing.

377. For the whole of England?—Not for the whole of England; for those parts that are not engraved.

378-9. Why should not the whole of the 1-inch map be dealt with in that way, so as to bring it up to date; would there be any difficulty in that?—I think we could revise the copper-plates almost as quickly; and they are much more satisfactory.

380-1. But are you going to do that?—We have never been in a position to commence the revision.

382. (*Mr. Roby.*) Those maps you are to publish by photo-zincography, they are not based on a very recent survey?—They are based on a survey of about five years ago.

383. The corrections?—There are no corrections; it is a new map.

384. (*Mr. Mather.*) Does the expense of publication of the maps generally include making known to the public far and wide, through various channels, that these maps are complete and can be obtained at such and such a place, or do you leave your work to permeate through the land in its own way; in publication is there anything spent by the Department in making the things known?—We have now nothing to do with the advertisement or sale of the maps.

385. So that, under the item of "publication," there is no expense that you know of connected with the actual promoting of the sale of the maps?—Nothing; the expense is entirely for the production of the map.

386. Then the term "publication" with you means "production"—making them ready for sale?—The term "publication" means that the map has been notified to the agent for sale.

387. But beyond that there is no expense charged against the Department for making the fact known?—No expense, and we have now no control over the advertisement and sale of the maps. There is one point connected with revision which I omitted to mention yesterday, and it has rather an important bearing upon the question. It is that practically we find we have to re-level the whole country. In portions of the country that we have re-levelled in Lancashire and Yorkshire we have found that one-third of our bench-marks have been destroyed, another third have been moved, and only a third have been undisturbed; if it be possible, there should be some legislation for the protection of these valuable marks. If something is not done we shall be constantly re-levelling the whole country.

388. (*Chairman.*) But, Sir Charles, could you protect a gate-post by legislation; I mean, could you legislate to protect a gate-post?—I am afraid that a good many of them have been wilfully destroyed by ignorant people.

389. There is already legislation against wilfully destroying, as there is legislation against moving your observation posts?—I think in foreign countries the bench-marks are placed under the charge of the local authorities.

Col.
Sir C. Wilson,
K.C.B., &c.
11 May 1892.

Col.
Sir C. Wilson,
K.C.B., &c.

11 May 1892.

390. (*Mr. Mather.*) And they are permanent marks; they are not put upon gate-posts?—They are not so numerous as ours are.

391. But they are fixed as bench-marks?—They are fixed as bench-marks.

392. (*Mr. Roby.*) The bench-mark is the permanent record of levels you have taken about the country?—It is the permanent record.

393. What are they generally placed on?—They are placed on the most permanent objects we can find.

394. Walls?—Walls or rocks; we generally place them on the parish churches, and the most permanent objects we can find.

395. What does the bench-marks consist of; is it simply a broad arrow and a line?—Yes. The level is the level of the horizontal line.

396. You might say a broad arrow with a straight line above it?—With a straight line above it.

397. (*Chairman.*) The bench-mark is the broad arrow with a flat line on the top, and that flat line is the level referred to?—Yes.

398. (*Mr. Mather.*) What would be the difficulty in putting down a permanent stone for the purpose of your bench-mark?—I think that that would be less satisfactory than putting the marks on permanent buildings.

399. But, excuse me, I do not mean avoiding the buildings; but where a gate-post, for instance, or temporary structure has been used, would it not be better, under such circumstances, where you require a bench-mark to make a permanent one of your own?—I do not quite understand.

400. Sir John said that these bench-marks are sometimes put upon gate-posts or any available structure which happens to be on the spot you wish to mark?—Yes.

401. There may not be a church there, there may not be a permanent building upon the particular place; well, instead of using any temporary structure near the spot, would you not put up a stone of your own, which of course would be known to be an Ordnance Survey stone?—I think stones of that kind would not be satisfactory; they would always be liable to settlement.

402. Then what do you use now for bench-marks, apart from churches and public buildings?—We put them on houses and the most permanent buildings we can find.

403. They are really not on gate-posts; that is only a figure of speech?—They are sometimes when there is nothing better available.

404. Instead of a gate-post, would you not think it better to put a post of your own up. No one would have a right to move a post put up by the Ordnance Survey; but the owner of the gate could move his post whenever he liked?—In certain cases it might be desirable; but it would involve a certain amount of expense. It must be remembered that there are three bench-marks to every mile of levelling in the country.

405. (*Mr. Roby.*) About how many would there be in the square mile?—It varies; I alluded to the lineal mile.

406. (*Chairman.*) And was that the number originally put or is that your modern practice?—That is the practice for the 25-inch survey.

407. That is the recent practice?—That has always been the practice.

408. When you spoke of one-third of your bench-marks disappearing, you meant those made in 1790? Were they liberal with them in those days?—The levelling did not begin till much later than that. I was alluding to one of the principal lines of levelling, from Liverpool to Spurn Head.

409. One-third of those bench-marks are gone?—One-third of those are gone.

410. When were they done?—They were done at the time of the survey of Lancashire and Yorkshire.

411. (*Mr. Roby.*) The 6-inch?—The 6-inch.

412. (*Chairman.*) That was at 1840?—That line was run in 1842-46 and was one of the principal lines of levelling in the country.

413. In your experience, have recent bench-marks been disturbed that have been selected under your direction?—We can never tell until we go over the country again.

414. (*Mr. Mather.*) But you have had no complaints from your surveyors?—A leveller, after he has levelled his line and cut his bench-marks, never goes near the country again; we know nothing about the bench-marks until we take up the revision of the country. We should never have known of the destruction of those in Lancashire and Yorkshire if we had not re-levelled the lines for the 25-inch survey.

415. Now we will go to the third point of our inquiry, "Whether the maps as at present issued satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed, and price, and whether any improvement can be made in the catalogue and indexes." We had better take one map at a time. Perhaps we had better take the 25-inch maps first of all. Have you heard of any complaints, Sir Charles, as regards the 25-inch map in style?—We have received suggestions of a very different nature. We find that few people agree on this point.

416. That has never been an engraved map, I think, has it?—When the 25-inch map was first published it was engraved. That was before the invention of zincography and photo-zincography.

417. What are your directions to your field men as to what they shall put into the map? First of all with regard to fences; are all fences shown by a line in the middle of the fence?—All fences are shown by a line representing the centre of the fence.

418. Then with regard to trees put into those fences, when do they put a tree which is an ornamental tree, and when do they put a tree which is a conventional representation of an actual tree?—I think if you would allow me, I should prefer to put in the printed instructions to our men; that would be more satisfactory. (*The instructions were produced.*)

419. I believe there was a good deal of discussion originally as to whether you were to put trees into your survey—I mean trees as separate from ornament?—Yes.

420. An actual tree, was it not so?—There have been very different opinions expressed on the subject. Some people who use the maps do not like trees; others think they are an improvement to the appearance of the map.

421. It was settled after a good deal of discussion that trees should be put in?—Yes.

422. (*Lieut.-Gen. Cooke.*) But only where they exist, I think?—Yes.

423-4. (*Mr. Mather.*) Would you kindly explain the practice of the Ordnance Survey as to showing trees?—The Ordnance Survey practice is to show trees in orchards and in woods conventionally, but isolated trees, whether in parks, fields, or hedge-rows, are shown in position. In some cases it would overcrowd the map to show all isolated trees. Some therefore are omitted, but such as are shown are, as a rule, in position. In hedge-rows where the trees are too close together to be all shown the first and last trees will be in correct position, the remainder will be stamped as far as there is room.

425. (*Mr. Roby.*) Is there anything by which the public could tell which are representations of actual trees and which are merely conventional?—Where there is no room for trees to be stamped the number is not the proper number; for instance, this row, (*indicating*) which extends from this point to that, would not have the proper number of trees because there is not room to stamp them.

426. (*Lieut.-Gen. Cooke.*) But the ends would be right?—The ends would be right.

427. (*Chairman.*) Now, I might ask whether the top or bottom of the tree or which point in the stamp has reference to the actual position of the tree?—The foot of the tree.

428. (*Mr. Roby.*) The stamp is all the same for all trees?—No, we make a difference for fir trees.

429. (*Chairman.*) Might it be possible, Sir Charles, to distinguish a tree which was an actual tree and a tree which was a conventional tree, by using a different stamp?—It would be possible to do that; but I think the distinction is sufficient already. All isolated trees are shown in their proper position.

430. (*Mr. Roby.*) What is the meaning of colouring?—The red is brick-work.

431. Is all the brickwork coloured?—All the brick-work and masonry is coloured.

432. Does that add much to the cost?—You will see the price at the foot of the plan.

433. Would it not be enough without colouring it; would it not lessen the cost?—The plans are sold coloured and plain.

434. Yes, but the uncoloured would only show certain lines; could it not be filled up by black; I could fancy the lines might be a little bothering in an uncoloured map?

435. (*Mr. Brickdale.*) We use uncoloured maps in the Land Registry.

436. (*Mr. Roby.*) Are these hand-coloured?—All hand-coloured.

437. You could not print them?—The sale is not sufficient to cover the cost of colour-printing. I may add that there have been very strong expressions of opinion against colouring. The feeling of those who use the large-scale maps is that they should not be coloured.

438. (*Chairman.*) With regard to pathways, Sir Charles, the men are instructed to put in every track they can find, I suppose?—The men are instructed to put in every track which appears on the ground.

439. Without inquiry?—Without inquiry.

440. The consequence is there is a great number of roads and paths marked on the map which are not paths or roads available for the public?—They are features on the ground. We never inquire whether there be a right of way or not.

441. Sometimes these paths would be very temporary, I mean they may not last six months; has your attention ever been drawn to that?—Occasionally we have had letters stating that a certain path is only a temporary path, and in these cases, after inquiry, we have removed the path from the plan.

442. (*Mr. Mather.*) Those permanent footpaths across a country and across fields which exist of course in every county, which give a right of way, and have done from time immemorial, do you mark these specially on your maps showing right of way?—No, we give the actual path. It would be impossible on a revision of the map to mark specially those paths over which there is a right of way.

443. Would it not be a great convenience to the public, and enhance the value of those maps if, when you come across a well-established right of way, you simply put on right of way?—The Survey has never taken cognisance of any question of property boundary, or of any question of right of way. To do so would involve the settlement of legal questions, and a great loss of time in inquiry.

444. In the case of a public footpath it would not be very difficult to put that on?—I think it hardly rests with the Survey to decide what is and what is not a public footpath. Our business is to show every path on the ground.

445. In going across country, who is to tell a man whether he can drive or ride across a part of the road unless there is some indication?—I hardly think it is part of the duty of the Survey to go into those questions.

446. (*Mr. Roby.*) You would hardly go the length of saying alleged right of way; you think it would be dangerous?—I think it would be dangerous.

447. (*Chairman.*) What I would suggest is that the field men—the surveyors—should, when they find insignificant tracks not formed in any way, but simply marked as a road across a hayfield, inquire whether that was a constant path, private or public, before they put it in. For instance, if you have a shepherd in a particular cottage, and his work lies in a particular direction, he will make a track, and if a different man occupies that cottage the next year that track ceases to exist. In one case there is a good cart road shown down to a piece of water. It settles the precise month in which that map was surveyed because there was a great drought that year; such a thing had never been known before. The people were obliged to cart water up to the house, and that is all on the map as a cart road. Is it a direction, Sir Charles, that only permanent footpaths should be shown?—It is a direction that only permanent footpaths should be shown.

448. And it is an error of the field men when these transitory paths are put in?—With a very large number of men scattered over the country there must be errors of judgment; but they are few.

449. I wanted to know what steps are taken to guard against it. I think you could guard against it if your instructions are that permanent paths only should be shown?—The instructions are that only permanent paths should be shown.

450. (*Mr. Roby.*) I am told that in Windsor Great Park there is on the 1-inch map no difference between recognised public roads on which people can drive regularly and tracks merely across the grass where possibly Her Majesty may drive, but nobody else. I was shown three or four lines, apparently to my eye exactly the same. I was told they represented as different things as possible. In most of the foreign maps there are six or eight different modes of marking different kinds of roads. For instance, the main road would be marked in one way, and a road—merely what we would call a parish road, or bye road—would be marked in another.

451. (*Chairman.*) A cart road is shown by two dotted lines?—Any unfenced road is shown by two dotted lines.

452. (*Mr. Mather.*) Why should there not be a reference on the margin of these maps to tell us what these posts and marks are. We may learn it generally, but each map does not appeal to the unsophisticated?—The difficulty has been to find room. The plans cannot well be larger, and in many of them the margins are occupied by parish names.

453. (*Lieut.-Gen. Cooke.*) A fenced and an unfenced road are distinguished?—Yes. I should mention that on the 25-inch map all roads are drawn to scale. For instance, a very narrow space between two dotted lines would represent a pathway.

454. (*Chairman.*) Would it be possible to put on the margin of each of these maps the explanations you have given in your books besides?—The difficulty is to find room on account of the large number of parish names. That is the reason why it has not been done.

455. (*Mr. Mather.*) Take a case of this kind; some maps have an immense amount of white unoccupied surface, and if you took a corner of the map, only a field, it would not interfere with the actual delineation of the field, if in the interior, which is not covered, you put a reference to that map?—You would find very great objections on the part of persons who used the map, if that were done.

456. Because of blotting out on the map itself?—I know that these maps are largely used for showing the rotation of crops in the fields. I have seen a map in which the cropping of the fields has been entered for six or seven years in succession, and if you placed the conventional signs in that field you could not insert the cropping.

457. Do you not think, Sir Charles, it would be a great advantage to the public if these maps are to be circulated and used very largely to have this information. I feel now a difficulty, without your being here to refer to, in interpreting these various roads, without some explanation, I mean?—Yes; but a large-scale map is used for property purposes and not as a road map.

458. (*Mr. Roby.*) On the uncoloured map could some plan be adopted by which the building could be shown without the necessity of colouring it?—I think not without destroying to a large extent the value of the map for the purposes for which it is made. I may perhaps be allowed to read two expressions of opinion at the Surveyors' Institution with regard to the colouring of these maps. Mr. Ryde, the President of the Surveyors' Institution, says: "It would be desirable in most cases in which the map is wanted in practice to have an uncoloured map, which would be capable of being coloured in any form whereby the purpose for which it is to be used might be best served." Mr. Clutton (past President) says: "It would be better to omit all colour from the plans and leave persons to colour them in any way that might appear best for their particular purposes." That is really the reason why we sell maps both coloured and uncoloured. This map was hatched to show the buildings, but it is to a great extent a matter of taste. Some surveyors do not like this hatching.

Col.
Sir C. Wilson,
K.C.B., &c.

11 May 1892.

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11 May 1892.

459. Does the cross-lining add much to the cost of production?—Yes, it adds to the cost of production.

460. Anything nearly so much as colouring?—No, this was done to enable us to sell a map, distinguishing buildings, at the same price as a coloured map, but many people do not like the hatching because it is more troublesome to show improvements on the map.

461. (Mr. Mather.) On that 25-inch map there are no elevations?—All the levels and bench-marks are shown on it.

462. (Chairman.) Why are the levels always on the line of the roads on these maps?—That is in accordance with the recommendation of the Committee.

463. And I suppose it is the most serviceable line to take, the easiest line to take to begin with, and the most serviceable?—In the old 6-inch maps of Lancashire and Yorkshire the lines of levels were to a large extent run from one trigonometrical station to another, and the Committee on contouring having these maps before them, recommended that the lines of levels should be along the roads.

464. But you get a very considerable number of levels of the roads as well?—Yes, perhaps I might read their decision: "That levels should be taken on certain principal lines, and at defined prominent points, selected upon some well-established principle, and such in particular as can be easily identified subsequently; the levels should be given in feet and with one or two places of decimals in addition, according to circumstances, and inserted in each of the maps proposed, to an extent proportionate to their respective scales. That primary levels will be more practically useful when given upon roads and highways, railways and canals, and on bridges, milestones, churches, and other substantial buildings, tops of hills, and all well-defined summits, as well as along streams and watercourses; on most of these situations will be found permanent surfaces on which the levels should be distinctly inlaid and marked for future reference; and at many other sites, artificial bench-marks should be fixed in a very permanent manner, for the levels given on a map may be considered as of more or less practical utility in proportion as they can be at any time ascertained with precision on the ground."

465. (Mr. Roby.) Have you by Act of Parliament a right to put your mark upon any buildings of that kind?—We have a right to make any necessary marks; we sometimes have complaints due to errors of judgment on the part of surveyors, but as a rule people are glad to have the marks on their houses.

466. (Chairman.) Well, as to the accuracy of the maps have you had any complaints as to the areas?—We often have letters pointing out errors in the areas, but they have been in nearly every case typical errors and not of computation. In every case in which we have received notice of these errors we have immediately corrected them on all the plans.

467. Are the errors in the printing?—In the stamping.

468. It is not in the computation?—It is not in the computation but in the stamping; for instance, 6's and 8's sometimes get interchanged. The correction of a plan is very much like the correction of proof for press, you cannot entirely avoid misprints.

469. (Lieut.-Gen. Cooke.) The errors are very few in comparison with the number of sheets issued?—I do not think we get more than three or four a year.

470. (Mr. Brickdale.) With respect to the areas, I have heard it said that in some cases a couple of areas would be thrown together which do not really form the same parcel. An inquiry on the ground or of the owners in the different places would have prevented this. Is that a thing that you ever heard of?—We have had occasional complaints of that kind. I do not see how they can be avoided. If our men were to go into questions connected with the boundaries of property and the ownership of the parcels on the ground we should never get the survey finished. The different parcels are bracketed together in the office. I do not see how we could get the survey finished if we had to ascertain the actual boundaries and areas of holdings.

471. It is a question of bracing—of what to embrace?—It is a question of bracing. What I have suggested once or twice to gentlemen who have written to me on the subject is that when the plans are published the guardians or other local authorities, if they considered

the bracings wrong, should rebrace the parcels themselves and that we should then recompute the areas.

472. (Chairman.) You would do that?—We certainly should recompute the areas and we have done so in cases where errors of that kind have been pointed out. In certain cases gentlemen have written to say that a small copse had been bracketed into the adjoining property, and when we get authentic information of that kind, we recompute the parcels and alter the areas.

473. (Mr. Roby.) Alter the areas of the plan?—Of the parcels on the plan.

474. (Chairman.) In the publication of the new edition it would be correctly "braced"?—It would be correctly braced on the new edition.

475. (Mr. Roby.) Is it not your habit to advertise that you have made your survey and that the maps are going to be published and to ask the people to examine if they are correct?—We advertise the exhibition of boundaries.

476. You then deposit the maps?—When the boundaries have been perambulated, and the maps showing them have been drawn, we advertise that on a certain day these maps will be exhibited and we invite every one interested to come and criticise them.

477. Is that the first portion of the map?—No, that is merely the boundary map.

478. It is only the skeleton?—Only a skeleton showing boundaries.

479. Is it on the 25-inch or 6-inch scale?—Sometimes it is the 6-inch and sometimes a larger scale.

480. Would it cause any delay if before publishing any map on either of these large scales you deposited them for a certain time in the locality so that owners or persons might have an opportunity of making suggestions?—I think it would cause very great delay in the publication, and that we should find very much what we do now with regard to the boundary sketch maps, that as a rule few people come to look at them.

481. (Chairman.) Your men have instructions to communicate with residents and inquire their names and spellings, have they?—Every name on the Ordnance Survey maps is given upon three authorities.

482. Three authorities?—The names are all written down in name-books with the names of the authorities who have given them, and the men have instructions to obtain the names from the best-informed people.

483. (Mr. Roby.) The authorities are persons in the district, not books, are they?—We give books separately.

484. (Mr. Mather.) You think the Welsh names are pretty correct on your maps; I think that is a crucial test as to the reliability of your plans?—The Welsh names were collected in the same way, there are three authorities for each name. At the commencement of the Welsh survey, the difficulty of obtaining the correct orthography was recognised, and Major-General Owen Jones, the officer in charge of the boundary office, who is himself a Welshman and a good Welsh scholar, recommended Mr. Rowland, who was also a Welshman and according to our information a very good Welsh scholar as a referee. Every name that appears on the map was sanctioned by Mr. Rowland until his death. When Mr. Rowland died, before the names on the map were completed, it was stated that Mrs. Rowland, his widow, was an equally competent Welsh scholar, and she was appointed referee in succession to her husband. Every name after Mr. Rowland's death was submitted to Mrs. Rowland. I do not think the Survey could have done more; every name has been submitted to persons who were reported to be competent Welsh scholars.

485. (Chairman.) Did you do the same with the Gaelic?—In Scotland we received gratuitous assistance from Gaelic scholars who came forward to help us. In Wales, Mr. and Mrs. Rowland were remunerated for their labours. In Scotland it has been found that in parts of the country Gaelic forms have been given to names of Scandinavian origin. In the course of centuries names have become corrupted, and it is sometimes difficult to say whether they are Gaelic or Scandinavian. When commencing the revision of Scotland I communicated with the Royal Scottish Geographical Society, and they at once acceded to my suggestion that a place-name committee should be appointed. That place-name committee is composed

of the best scholars in Scotland, and it is working most cordially with us in the revision of the names. When Wales is revised the same plan might be adopted, but there appears to be no authoritative body such as the Royal Scottish Geographical Society.

486. (*Mr. Mather.*) Do you ever use the conventional name as well as the name a scholar will give you; there are some places, for instance, in Lancashire where the conventional name is very different indeed from the name that would be put upon the map; do you ever give the two pronunciations, I mean, of the one place?—We give double names for parishes in cases in which the Local Government Board have not adopted our orthography.

487. (*Mr. Roby.*) For instance, you give Brighthelmstone and Brighton on the map?—On the old map, but we only give Brighton now.

488. How does it stand as regards Ireland with regard to the names?—The Irish names were collected in a very thorough manner by one of the best Irish scholars of the time, and they have never been altered since; they have been accepted everywhere.

489. Do you get any complaints?—Never from Ireland. I should mention a difficulty we find with regard to names. In one parish for instance there were three separate parties who spelt their parish name in a different way, and it was difficult to decide which form should be adopted.

490. (*Chairman.*) I think we had better go on now with the 6-inch map.

491. (*Mr. Roby.*) Are you publishing the advanced maps of the 6-inch by photo-zincography?—The more recent 6-inch maps are published by the photo-zincographic process.

491a. Is the engraving of the 6-inch map all finished?—All the engraved counties are finished.

492. These photo-zincographed maps you regard only for temporary purposes, you will not keep that up?—Yes, we shall keep them up.

493. (*Chairman.*) What is the history of the 6-inch maps; what is the procedure with reference to their publication?—Originally the view was that two classes of large scale maps should be published; that every parish should be published complete in itself on the 25-inch scale, and that every county should be published complete in itself on the 6-inch scale. Under that system if a portion of a parish occupied only a corner of a sheet that sheet was sold as one of the plans of the parish. Gradually complaints were made that the plans did not show property extending over parish boundaries. It was then decided to publish full sheets; and that is the system now with regard to the 25-inch. The 6-inch scale maps were originally engraved as county maps, and no ground was shown over the county boundary on any sheet. Afterwards, as in the case of the 25-inch map full sheets were published. When the Survey was expedited in 1880 and the vote was increased for the completion of the 6-inch and the 25-inch maps, it was found impossible to engrave the 6-inch map in a reasonable time; the photo-zincographic process was consequently introduced to bring out the 6-inch map more rapidly. Under the system which prevailed during the rapid publication of the survey, the 6-inch map was published without contours before the parent map on the 25-inch scale was brought out.

494. (*Mr. Roby.*) Published by photo-zincography?—By photo-zincography.

495. (*Chairman.*) What date did you change from engraving to photo-zincography?—About 1881.

496. How much of England had been engraved?—I have a coloured diagram from which you will see at once the engraved and the photo-zincographed counties. The 6-inch maps of 22 counties are engraved, and those of the remaining 30 are photo zincographed.

497. Will you continue the history, Sir Charles?—When the photo-zincographic process was introduced for the 6-inch map, a calculation was made with reference to the undertaking to complete the 6-inch map by the 31st March 1890. It was then decided that certain counties that were in process of engraving should be completed by engraving, and that the other counties should be photo-zincographed; that was carried out, and the whole of the 6-inch map was published on the 31st March 1890. The 6-inch map of Lancashire and Yorkshire being engraved, I considered that it would be very desirable, if possible, to retain such beautiful

work. In the northern parts of the counties I found that it would be quite possible, within a reasonable time, to revise the 6-inch plates; but I am sorry to say that it would be quite impossible to revise the 6-inch plates of South Lancashire and South Yorkshire in anything like a reasonable time. In South Lancashire and South Yorkshire the 6-inch sheets will therefore be published by photo-zincography. In revising the northern parts of Lancashire and Yorkshire the plans are being prepared in this style. This is one of the revised sheets. The adjoining county has been lightly engraved in skeleton with contours so that the sheet may be used for any engineering purpose.

498. (*Mr. Roby.*) The adjoining county is taken in the same way from the same original as the other county?—It has been fitted in.

499. (*Chairman.*) That is in fact a development of the map first started in county form; now you have it a sheet map?—Now we have made it a full sheet.

500. (*Mr. Roby.*) Is it intended, as far as it is arranged at present, to have part of England permanently engraved and part permanently photo-zincographed?—It is not possible to answer that question at present; but my impression is that we shall have to give up the whole of the engraved plates of the south-eastern counties; the changes have been so great that it would take too long to revise the engraved plates.

501. That you cannot correct your plates?—We could do so, but it would take a very long time.

502. I mean that you do not contemplate superseding the photo-zincography where it exists in that condition for that purpose by an engraving?—No.

503. You have ceased to engrave?—Except in cases in which there is a 6-inch engraved map published, and few corrections are necessary; for instance, in Scotland, the changes have been small.

504. Where, in fact, the plates are capable of being altered and kept up to date, you will work from the engraved plates?—From the engraved plates.

505. But where no engraved plates have been made you are not starting engraving?—No.

506. You are satisfied with the photo-zincography; it produces a satisfactory map?—It gives a good practical map in a very short time, and I think our maps are equal to those of a similar kind that I have seen elsewhere.

507. (*Lieut.-Gen. Coote.*) Could you state what the saving was—the saving between the date of the introduction of this process and the date of the completion of the 6-inch map—I think it was something like 80,000l.?—I think between 80,000l. and 100,000l.

508. (*Chairman.*) And many years in time?—And many years in time.

509. (*Mr. Mather.*) And as the copper-plates wear out will they be superseded by photo-zincography?—The copper-plates are now duplicated by the electrotype process; there is now no wearing out.

510. You renew them, in fact, from time to time?—We take a duplicate before the copper-plate has become worn.

511. You always have a good duplicate in hand, then?—We always print from it, and the original is preserved for reproduction.

512. (*Mr. Roby.*) Are the plates from which you get the photo-zincographic edition permanent; will they bear a good many impressions?—The negatives are kept.

513. And you can reproduce them to any extent?—We can always take a new transfer from the negative.

514. I notice what I think is a fault, namely that the colour of the paper has been changed; in Gloucestershire you get your plan of mixed colours, sometimes a white and sometimes a yellow paper; you cannot join them up without great disfigurement?—The paper has always been a difficult question.

515. (*Chairman.*) What was the difficulty that led to your having two colours of paper in one county?—At first a soft paper was used; that was good for printing, but was not good for use in wet weather; it was a soft unsized paper. Afterwards when there were complaints about that paper, we adopted a harder white paper; wherever maps are demanded for mounting we always supply them on the same kind of paper.

516. It is rather Mr. Stanford's fault, then, when he sends out a series some of one colour and some of another?—I do not say it is Mr. Stanford's fault; if a

Col.
Sir C. Wilson,
K.C.B., &c.

11 May 1892.

Col.
S. C. Wilson,
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11 May 1892.

landed proprietor states in his demand that he requires maps for mounting, Mr. Stanford informs us, and we supply him with special sheets for that purpose.

517. (*Mr. Roby.*) When maps are intended to be mounted is there any advantage in having them on a thick sheet of paper instead of a thin one to start with?—Thin paper is rather more difficult to mount than thick paper; there is no very great difficulty.

518. Have you ever tried a very thin hard paper for maps? It occurs to me that in many cases it would be much more convenient to be able simply to buy a few sheets of thin hard paper and put them in one's pocket than to carry these thicker ones?—About 16 or 17 years ago I tried to introduce an Austrian paper—*hanf papier*—into England for military maps; that is a very tough, thin paper, but it was not much liked. At present we print upon what is known as "Evans's thin tough paper," which I think is almost as good as the Austrian paper, but we find that few people like it.

519. (*Mr. Mather.*) Have you a sample of that here?—I do not think so. We find that for military purposes many officers prefer maps printed on linen.

520. A printing direct on linen?—Direct on linen.

521. Without paper at all?—Without paper. And that, the thin paper, which I think personally is the best, is not generally liked.

522. (*Mr. Roby.*) Have you ever tried printing on some of the thin tough Japanese paper?—No; we have not gone further with experiments, because we found that the thin paper was not liked.

523. I have some Japanese paper now which I can take and crumple up and pull out again, and it will not tear?—Yes.

524. (*Mr. Mather.*) Have you one of the special maps on linen here?—No.

525. That strikes me as being a practical mode of producing a durable map?—Opinions differ; some officers prefer paper mounted on linen, others prefer maps printed on linen, and others again like the thin paper.

526. (*Chairman.*) It is rather a question of eyesight; on linen you do not get so clearly-defined a map as you do upon paper?—We get it quite as well-defined.

527. (*Mr. Mather.*) Is it glazed linen, Sir Charles?—It is slightly glazed.

528. (*Mr. Roby.*) Are you able and willing to supply the public with copies of your maps printed on such special materials?—We do so whenever they are asked for in the case of 6-inch or 1-inch maps.

529. But only for Government officials?—If anybody specially asked for copies on thin paper we should supply them, making a small extra charge.

530. But it would not be a very large one?—No; not a very large one.

531. (*Chairman.*) With regard to the contour lines, have you ever thought of printing contour lines in colour, making it part of the geography of the country?—We have tried experiments in printing contours in colour on the 1-inch map, but I cannot say that we have had very much encouragement to go on with them.

532. Would it add very much to the cost?—We charge a higher price, because it is printed in two colours. This is a map of Brighton; on this sheet the contours are in red and on that in black. This is a sheet on the 6-inch scale with the hills in brown.

533. That is very elaborate contouring?—That is merely a reproduction of the field sketch.

534. I was asking you about colouring in contouring on the 6-inch maps; would there be any objection to putting in the contour lines in some sort of colour?—It would add to the expense to show them in colour, as there would be double printing.

535. (*Mr. Roby.*) Would it practically make much difference if spread over a considerable number?—Our publication is carried out under peculiar conditions; they are that the whole cost of publication should be paid by the sale of the maps; if we were certain that there would be a very large sale we could do many things that we cannot do now.

536. (*Chairman.*) Well, now, is there any reason why a contoured map should not be sold at a little more money than an uncoloured map, and all contoured maps printed in colours?—The only objection is that people think the maps too highly priced already.

537. Is it so; is it very dear to pay 1s. for that sheet; I am talking of the 6-inch maps now?—I think that the engraved 6-inch sheet is cheap for its size.

538. Is not the photo-zincographic map a cheap map too for the information it gives?—I think it might be cheapened. At present the public can buy an engraved whole sheet for 2s. 6d. and they have to pay 4s. for the same area in four quarter sheets of the photo-zincographed map; that is an objection which has always been made to that map.

539. To the engraved map?—To the photo-zincographed map.

540. (*Lieut.-Gen. Cooke.*) What do you say is the difference?—Four quarter sheets cost 4s.; the full sheet is 2s. 6d.

541. (*Chairman.*) In fact your photo-zincographed map is dearer than the engraved map?—Dearer than the engraved map.

542. Why is that?—From the manner in which the cost is charged; in the case of an engraved map nothing is charged except the cost of the paper, the printing, agency, storage, &c., and a slight margin of profit which is kept for the revision of the plates.

543. For a photo-zincographic map; the whole cost of the operation is charged?—The whole cost of the operation after a certain stage, and there are four pulls instead of one.

544. (*Mr. Mather.*) The actual prime cost of the photo-zincographic map is greater than of the engraved?—Not the preparation of the negative.

545. No, not the preparation, but the cost per map, per sheet printed?—Yes.

546. (*Chairman.*) Your engraved map is a whole map, and a photo-zincographic map is only one quarter of that; why should not the photo-zincographic map be four times as large as it is now?—There are technical difficulties in the way.

547. The process by which it is produced is very nearly akin to the process by which the 25-inch map is produced; the printing is identical, is it not?—We place four 25-inch maps on a screen, and then reduce them to the 6-inch scale.

548. And for the size of the original engraved sheets you would want 16?—You would want 16 25-inch sheets pinned up on a screen and reduced by one operation to the 6-inch scale.

549. (*Mr. Mather.*) And that you would not get done by any lens known in the art?—We have tried that as an experiment, but the result was not quite satisfactory.

550. (*Mr. Roby.*) But could not you do that by first reducing the four 25-inch to one and then afterwards taking a copy from those four put together?—You would not get such a clear image in that way.

551. (*Chairman.*) Do you think there would be any advantage in contouring in colour?—I think that colour shows up the contours.

552. If the cost was no objection you would prefer doing it in colour?—We should do it in colour.

553. (*Mr. Roby.*) The 6-inch maps all contain contours; do they?—Now they all contain contours. The Treasury authorised us to bring out an edition without contours, and then, when the contouring was completed, an edition was to be issued with contours. The final edition has now been published.

554. (*Mr. Mather.*) With relation to this 6-inch map there seems to be a want of definition as to the signs; there are certain forms used here that are unintelligible unless you are instructed; the general public would have to be instructed on the question. I do not see anything in the margin in the way of explanation of these little conventional signs. It must be very difficult for a person to interpret them unless he knows beforehand; for instance, how do you distinguish the levels?—The levels are marked by a small dot.

555. Would it be difficult to put that information on the margin?—No; excepting the want of space. The margin is very often cut off for mounting.

556. (*Mr. Roby.*) Are the contours as close as you think is desirable?—The contours are in accordance with the recommendations of the Contour Committee; the view that the Committee took was that only instrumental contours—contours run with extreme accuracy—should be shown on the maps, and that the interpolated

contours on the Yorkshire and Lancashire maps were misleading and should be discontinued.

557. To increase the number of contours with the same accuracy would be a considerable addition in expense, would it not?—A very large expense.

558. The expense coming from the actual levelling of the survey?—The contouring is distinct from the levelling; it is based on the levelling; but it is carried out by contourers.

559. But I mean the expense is not the expense of drawing the map but the expense of getting the materials?—The expense of getting the materials; the great engineers of the day considered that anything that was not absolutely accurate was misleading.

560. Have you had many complaints of late years from surveyors or engineers of the deficiency of the contours in point of number?—We have had no complaint from engineers that I remember; engineers appear to use our bench-marks and not the contours; but a great change has taken place in public opinion in England with regard to the representation of ground. Twenty years ago hardly anyone advocated the use of contours for the representation of ground; now a feeling has grown up that that is the best mode of representing ground.

561. (*Lieut. Gen. Cooke.*) Better than vertical hachures?—That is the view now. I may mention that in the contour controversy the officers of the Survey were I believe, without exception, in favour of having contours, and that it was on the advice of men like Brunel and other celebrated engineers of the day that the contours were discontinued in favour of a large number of bench-marks and levels.

562. (*Mr. Roby.*) By "the contours discontinued" you mean the interpolated contours or all contours?—The interpolated contours and the diminution in the number of instrumental contours.

563. (*Chairman.*) The substitution of contour lines for levels marked in figures on the maps requires as much levelling as any system of bench-marks?—The instrumental contouring is almost the most expensive work that we do.

564. (*Mr. Roby.*) I am not clear that I quite know what you mean by instrumental contouring?—An instrumental contour is a contour shown on the map within a limit of error of three-tenths of a foot. The other contours are interpolated by means of a water level. Those contours are not accurate within the limit mentioned.

565. And the officers of the Survey at that time would have preferred to keep the interpolated contours?—They were in favour of keeping to the original standard of instrumental contours. In 1853 there were instrumental contours at 25 feet, 50 feet, 75 feet, 100 feet, 150 feet, 200 feet, 250 feet, 300 feet, 350 feet, 400 feet, 450 feet, and 500 feet above the sea; and then every 100 feet up to 1,000, and every 200 feet up to 2,000. The number of instrumental contours was modified from time to time. A complete statement will be given. (See Appendix XII.)

566. (*Mr. Mather.*) Is there anything on the map to show, Sir Charles, which is an instrumental contour or an interpolated contour?—Small round dots. It is shown in a slightly different character on the 6-inch scale.

567. (*Chairman.*) Major Johnston and I have followed one of those contour lines, and I was pointing out to him the things on the road which we know are levels; and I was pointing out that the dots were sketched, and he said, "Oh, no," they are levels instrumentally levelled?—Yes, they are instrumentally levelled, although small dots are not shown.

568. In the present 6-inch maps none but the instrumental contours are shown?—None but the instrumental contours, excepting in Lancashire and Yorkshire where we have kept all the interpolated contours.

569. Do you think the contours on the 6-inch maps are sufficiently close together to give an approximate idea of the country?—Not to give an indication of the form of the ground; they were not intended to do that.

570. Would it be very costly to add that?—It would be very costly to give instrumental contours.

571. (*Mr. Roby.*) Could you give us any idea of the cost?—The cost of contouring has varied from about 1*l.* to 17*s.* per lineal mile of contour.

572. (*Mr. Mather.*) That is a tremendous expense?—It is a tremendous expense.

573. Because to be of any value it must be accurately done?—It must be accurately done.

574. You must make very frequent observations in the course of a mile?—The line is first laid out with pickets, and then surveyed. In fact, the engineers who gave evidence before the Committee thought that contouring would not be worth the expense. They were very strong upon that point.

575. (*Mr. Brickdale.*) I understand that these 6-inch maps can be got on thin paper for the asking?—If a special demand is made for a map on thin paper, we supply it.

576. In a few days?—We do not keep any stock because when we have the plate we can print from it on thin paper.

577. But with the 25-inch; you do not keep the plate, and you cannot supply it on thin paper?—No, not without recopying.

578. (*Lieut. Gen. Cooke.*) If great accuracy is required you are always ready to supply a tracing from the original map, are you not?—Yes.

579. (*Mr. Mather.*) May we take it, Sir Charles, if you were requested to put the reference on these sheets as to the signs on the maps you could do it without much expense or trouble?—I think we could do it on most of the maps. It is rather difficult, because the detail cannot run up to the end of the plate.

580. Yes?—It is a question of space more than anything else.

581. But possibly by using two sides of the map, or the top and bottom of the map, so as to encroach very little upon the margin beyond the actual plate itself, you might, at any rate, put in three or four references to explain the principal points; not every point, but the principal points?—Yes.

582. (*Lieut. Gen. Cooke.*) You might put them in a row. That would take very little depth. You might put them in a row along the bottom. That would take a great number?—Yes, but it would not look very well.

583. (*Mr. Roby.*) Would there be any difficulty, Sir Charles, in putting the 6-inch sheets of towns together so as to make convenient combined maps of the towns in the same way in which you have done the 1-inch map of Brighton?—There is no practical difficulty. The reason why we have not done it is that we have been so pressed to complete work that has not been published at all. If we had once finished the map of England we could turn our attention to work of that kind.

584. For instance, my own house comes just at the corner of a 6-inch map, and I have to get four of these 6-inch sheets in order to get it in?—We have been authorised to produce combined sheets now, and the Brighton sheet is the first published. We are now producing a Chatham sheet, and we shall continue to publish combined sheets on the 1-inch scale.

585. That applies, of course, more to the 1-inch than to the others?—To the 1-inch. We should do it on other scales as well, if money was available. The question is whether the money voted should be spent on special maps, or on the production of new maps which are more urgently required.

586-7. (*Mr. Roby.*) In the case of the 1-inch, as I understand, the photo-zincographic sheets are not intended to be permanent, but merely temporary?—They will all be replaced by engraved sheets by the end of 1896.

588. (*Chairman.*) With the hill-shading?—No, not with the hill-shading, that will come afterwards.

589. You have made no attempt in these maps to show the depth of pieces of water. In Swiss maps and the maps of other countries of a similar class, the contour lines of depths are shown. There is no attempt to show soundings of any of the English lakes, is there?—That has never been regarded as part of the work of the Survey; it has been looked upon as a hydrographic operation. The Survey has no provision for carrying out work of that kind.

590. No; but is there any legitimate reason why they should not do it if it is desirable to be done?—There is no reason why the Survey should not do it if directed to do so.

Col.
Sir C. Wilson,
K.C.B., &c.
11 May 1892.

Col.
Sir C. Wilson,
K.C.B., &c.

11 May 1892.

591. You could not throw it on the Hydrographical Department of the Admiralty?—I think the work would be better carried out by the Admiralty staff, who are accustomed to take soundings, than by persons who are not accustomed to do so.

592. You think that your men are not mariners enough?—We could easily do it after a little experience; but I think it could be more economically carried out by the Admiralty.

593. You perhaps would be rather glad of their co-operation?—We should be very glad of their co-operation.

594. (Mr. Mather.) Are the depths of the lakes in Cumberland, for instance, notified in any of your maps?—I do not think that any of them have been completely sounded. I do not remember seeing any maps of that kind. The depths would be useful for scientific purposes.

595. (Chairman.) In fact, to complete the map that ought to be shown?—Yes.

596. (Mr. Mather.) The Admiralty would lend you an expert at any time to do that?—That is connected, to a certain extent, with the expenditure of the Survey Vote; until recent years little attention was directed to the depths of lakes; and it was a question whether money voted for the Survey should be spent in taking soundings.

597. (Chairman.) With regard to the price of this 1-inch map. These are 1s. each sheet; do you regard that as an expensive map, or a cheap map, Sir Charles?—I think that for an engraved map it is cheap; but about two years ago, or rather more, I submitted a proposal for publishing a cheap edition by transfer from copper to zinc, and to sell that to the public at 6d. a sheet. The question was considered, but it was not deemed advisable to bring out a cheap edition then; and I think the matter was afterwards considered by the Committee which has been sitting upon the sale of maps.

598. The price that you mention would have been just sufficient to cover the cost of the map?—That would have covered the cost and the 33½ per cent. paid to the agent.

599. (Mr. Roby.) How long is it since the price was raised to 1s. When I first bought Ordnance maps they were 6d. the quarter-sheet?—Do you wish to have all the changes in the prices; I can give you them at once.

600. Is it the result of a different calculation of the cost, or is it a determination to throw more of the cost upon the public?—I think the price was fixed too low at first and that there was a certain loss. In 1866 the price of the full 6-inch sheet was reduced from 5s. to 2s. 6d., partly blank sheets were reduced from 2s. 6d. to 2s. The full sheet of the old 1-inch map was raised from 2s. to 2s. 6d.; the half sheet of the Scotch map from 1s. to 1s. 9d.; and the small English sheet was raised from 6d. to 1s.

601. When did the change of price commence?—After 1866; the only change since has been that the 25-inch sheet with areas has been raised from 2s. 6d. to 3s., and the town sheet from 2s. to 2s. 6d.

602. The price is based entirely upon the cost of production?—On the cost of production, leaving a margin for the correction of plates and new editions.

603. It is entirely based upon that?—Entirely based upon that.

604. Therefore any question of the reduction of price would mean that the public would have to pay the difference between the producing price and the cost price?—Yes.

605. (Mr. Roby.) Where do you commence the cost price in reference to charge on the public; at which stage of your preparation?—We commence the charge for the engraved sheets, at the completion of the copper plate, and the photo-zincographed sheets at the supply of the transfer.

606. (Mr. Mather.) And is the cost of all this, Sir Charles, covered, as a rule, by the price you receive from the public?—If all the maps were sold it would be covered and more than covered. The origin of the publication of the maps appears to be as follows: The first maps engraved on a large scale were the 6-inch maps of Ireland, and they were engraved in consequence of a statement by Sir Richard Griffiths, the Valuation

Commissioner, that he required six copies of each map for valuation purposes. It was calculated that the cost of tracing these six copies would not be less than that of engraving them; and the 6-inch map of Ireland was consequently engraved. The map of Ireland is used extensively for valuation purposes; and when the Survey was transferred to England it was believed by Sir Henry James, who recommended that the maps should be published, that they would be used as they were in Ireland, and that there would be a certain sale of the maps. On his evidence, and on the recommendations of the various committees, it was decided to publish the large-scale maps in England. There has not been the sale that was anticipated, as the maps have not been generally used for the various purposes for which they were made and, we have now a stock of maps valued at no less than a quarter of a million of money.

607. Printed maps ready for sale to the value of a quarter of a million of money?—We have two or three million impressions at Southampton ready for sale.

608. And are these maps saleable; do they contain information that you would like to supply to-day?—The old maps are obsolete.

609. Therefore it is absurd?—When a revision takes place those maps will be condemned.

610. By degress this quarter of a million of money would be obliterated from your books?—There has been a margin of profit which will partially cover the loss upon the condemned maps.

611. (Chairman.) Those are all the 25-inch and 6-inch?—And 1-inch.

612. The 1-inch always sells readily, I suppose, does it not?—Yes, that sells well.

613. You have no large stock of 1-inch?—We never keep a large stock of 1-inch in hand; we keep what we think will meet the supply.

614. The mass of stock that you have is of the 6-inch and 25-inch?—Of the 6-inch and 25-inch.

615. More or less unsaleable?—There is a certain sale, even of the oldest maps.

616. You only print 25 copies of the 25-inch scale?—It depends upon the class of map. We know pretty well the sheets that will sell, and we print editions of 30 to 60 copies.

617. I suppose some of the sheets you have not sold a sheet of?—We have sold copies of every sheet.

618. You think you have?—Yes, every sheet has had a certain sale.

619. (Mr. Roby.) But the demand is very unequal?—Very unequal. Some sheets run to three or four editions; of other sheets we sell only three or four copies.

620. (Mr. Mather.) What is the total turnover of the sale of maps?—19,000l. for 1891.

621. What would be the profit on that; how much of that would you put against your capital account to reduce it or to pay interest upon it?—It is almost impossible to say for a single year, because we do not know the actual sheets sold; the profit varies with the class of map; but I should say that if all the maps had been sold the total profit since 1858 would have amounted to about 1,000l. a year. There would have been a profit of something like 30,000l. to 33,000l. since 1858.

622. (Mr. Roby.) Has there been that profit, do you think?—I had a return made up the other day, and it showed that.

623-4. On the cost of publication?—Yes; but of course that sum, to a very large extent, would have to be set off against the condemned maps when the revision takes place.

625. (Mr. Mather.) Yes, but if you have a quarter of a million of money in condemned maps, or nearly so, your 30,000l. will not go very far?—I hope they will not all be condemned.

626. (Chairman.) With regard to the amount of the detail on your 1-inch maps, have you put as much detail into them now as you did when you first began to publish the new series?—We have made an alteration with regard to names. We do not put in so many names now as we used to.

627. (*Mr. Roby.*) What are the names that you omit?—The least important names.

628. The names of houses?—Those we think of least importance.

629. (*Chairman.*) Do you allow so many names per mile to your surveyors, or how are they to form an estimate of how many names they are to put in?—The number of names is treated more as a matter of appearance. There is a photographic reduction from the larger scale to the 1-inch, and the officer in charge of the Engraving Department, Major Conder, who is an officer of great artistic taste, personally goes through the names on the reduced photograph, and crosses out those that are not to appear on the 1-inch map.

630. Guided by his eye, in fact?—Guided partly by his eye, and partly by the importance of the names.

631. He would strike out farmhouses or the names of farmhouses if apparently they overcrowded the map, but he would leave them in if there were very few other names?—Partly so, but it depends on the district. In some districts in the south-eastern counties, and in the east of England, the farmhouses are old houses of considerable importance, and their names are left in. In other parts of the country the farmhouses are comparatively small, and their names are crossed out.

632. The practical result is that your more recently published maps are not so full of names as your first published ones?—Yes, that is so. I may perhaps add that our omission of names has caused, in some districts, a good deal of dissatisfaction; we have had letters from gentlemen complaining that the names of their houses have been omitted; it is rather difficult to please everyone.

633. (*Mr. Roby.*) I suppose, as a rule, you would keep in the names of any houses or farms which were, to a certain extent, well known in the district and would form some guide to people?—Yes, I think this will explain the present system of preparing the 1-inch map. This is a 6-inch map, which has been taken to the ground and examined with regard to the character of the roads. The first-class roads are inserted in one colour, the second in another, and the third in another colour, and the examiner makes remarks upon prominent features that should appear on the 1-inch map.

634. Merely preparatory to the production of the 1-inch?—Preparatory to the production of the 1-inch.

635. (*Lieut.-Gen. Cooke.*) Has that been done on the ground for that purpose?—That has been done on the ground.

636. (*Mr. Mather.*) I understand Sir Charles to say that it would take about five years to go through the revision of the 1-inch map?—I do not think that was the question; I think I said about five years to the completion of the engraved map.

637. What time will be necessary to put you in possession of the information required to give a thoroughly reliable map up to date?—The sheets at present being published are quite up to date; they are based on a recent survey, five or six years old.

638. That is you can get a sheet of any part of England and Wales revised up to date on the 1-inch scale?—The sheets we are engraving now are being engraved from a survey about five or six years old. We have not commenced revising the 1-inch sheets that have been published.

639. To put the country in possession of a thoroughly reliable 1-inch scale map for England and Wales alone, what length of time would be necessary to complete the work?—That entirely depends on the sum of money spent upon it.

640. (*Chairman.*) The only part of the country that is represented on the new series of 1-inch maps which is still old is Lancashire and Yorkshire; all the rest are founded upon a very recent survey?—The south-eastern counties are old.

641. (*Mr. Mather.*) There is a great deal of it old. I was only asking, if you had to produce a thoroughly reliable map of England and Wales on the 1-inch scale, how long would it take you to do it?—If we commenced revising the 1-inch sheets this year, we could produce the whole map in a perfect state by the end of 1896.

642. Yes, I thought about five years; and for that purpose you would require a special expenditure?—A special expenditure.

643. Above and beyond what you are now expending for that particular object?—Yes.

644. (*Chairman.*) I asked whether it would be 2,000l. ?—I think under 2,000l.

645. (*Mr. Mather.*) But could you not with a larger expenditure undertake to produce it in less than four or five years—before 1896?—I do not think we could greatly expedite the engraving of the 1-inch map in outline. We could revise the south-eastern counties on the 1-inch scale in much less time.

646. (*Mr. Roby.*) Dealing with time, could you tell us what is the date for instance of the survey of Somersetshire—is that comparatively recent?—I think Somersetshire was only finished in 1886 or 1887.

647. And Cornwall?—Cornwall was surveyed in 1874-84.

648. And again, as regards Lincolnshire and Nottinghamshire?—Lincolnshire was surveyed in 1883-87 and Nottingham in 1875-84. In continuation, these are some of the little maps that go to the engraver, with Major Conder's signature and the names crossed out as he has decided on them.

649. (*Chairman.*) These are for the engraver?—These are for the engravers to work from.

650. (*Mr. Roby.*) You put contour lines on all the 1-inch maps now, do you not?—On all the 1-inch maps; but only instrumental contours.

651. Only instrumental contours, but at the same distances as you have already mentioned, in regard to the 6-inch?—They are transferred from the 6-inch.

652. Have you ever tried the representation of the hills by colour in any way?—We have tried several experiments; this is part of an Irish map which shows the effect of colour. That is an impression in black; that is an impression in brown; and this in a kind of grey.

653. True, but not so as to give different heads in different colours?—To prepare special maps of that kind has always been looked upon as the work of private firms.

654. Do you think it would be satisfactory; have you seen anything that would be satisfactory for general public purposes?—I think for instructional purposes and for scientific purposes maps with zones of colour are very useful.

655. There would be no difficulty in your doing it, I suppose, would there?—As regards the execution of the work there would be no difficulty in our preparing maps of that class. The question is whether a portion of the Survey Vote should be devoted to that purpose.

656. Whether it would not be putting aside more important work?—More important work. You cannot get the same result from an engraved plate in colour, that you can in black.

657. Which do you prefer yourself—which style of doing the 1-inch map—of the three which you have shown, one of which is in black, one in bluish grey, and one in brown?—Personally I prefer black; but it is purely a matter of taste. I may perhaps mention that every foreign country has a map printed in black, with the hills in black, and that they have in addition other scales printed in colour. For instance, the standard map of France on the 1/80,000 scale is in black, and I may add that the Germans, I was informed the other day, are going to abandon contours, and have only vertical hachures in their new map.

658. Vertical hachures more or less conventional?—Yes.

659. Without any precise examination of the difference in thickness?—That I am afraid is rather a theoretical point. The scale of shade has never been systematically applied in this country, at least I have not seen any maps in which it has been completely carried out. It is very good for purposes of instruction, for you must teach draughtsmen on the same system.

660. (*Mr. Mather.*) Do you require an education to interpret the scale of shade?—It would require education. I may perhaps read, as bearing on the question of special maps that has been raised, the evidence of Sir Charles Trevelyan, which explains the rule that has always guided the Survey with regard to them:—“By this means a permanent map will be obtained “on a sufficiently large scale to admit of subse-

Ccl.
Sir C. Wilson,
K.C.B., &c.

11 May 1892.

Col.
Sir C. Wilson,
K.C.B., &c.
11 May 1892.

"quent alterations and improvements in the face of the country being transferred to the map, and as by placing the map at the disposal of private publishers materials will be furnished to them for the construction of every description of maps on reduced scales suited to the public taste, it appears to my Lords that the interference of the State ought, as has been suggested by the Duke of Wellington, to stop at this point, and that it will not be necessary to put the public to the expense of having any other map engraved on a reduced scale." That is the principle upon which the publications of the Survey have been conducted. In Scotland our maps are utilised to an extent which is almost unknown in England. Mr. Bartholomew, for instance, has published a very good map on the scale of half-an-inch to the mile, reduced from the Ordnance map; and he has also published special maps.

661. (*Chairman.*) Does not he apply to you for any licence?—The question of copyright rests with the Stationery Office. The view generally taken is that so long as the map is not a reproduction on the same scale it is not an infringement of copyright.

662. I suppose Crutchley's maps were also taken from yours?—I believe all the maps are taken from ours, but I think in that respect the Scotch publishers have gone very much ahead of English publishers.

663. (*Mr. Roby.*) But there is no tendency on the part of the Stationery Office to needlessly interfere on the ground of copyright with any private publisher, is there?—I am not certain that they have interfered in any case. The only bad case was one in which maps were sold as Ordnance Survey maps, and advertisements were sent to gentlemen in the country that so-and-so had published a new Ordnance map.

664. I understood that anybody is at perfect liberty to use it provided he does not preface the authority of the Department for it, and provided it is not really an actual reproduction. You think an actual reproduction would be objected to?—I think that would be an infringement of the copyright.

665. Undoubtedly legally the Stationery Office could object; but I was wondering whether they had?—It would be selling a map that was not the genuine article.

666. (*Mr. Mather.*) If they were to stamp it with the words "Reproduction from the Ordnance Survey," I suppose you would not object?—I think an actual reproduction ought to be objected to.

667. Although they stamped it with that?—Yes; because we go to the entire expense of engraving the map, and, by a cheap reproductive process, they could publish the map for a trifling sum.

668. (*Mr. Roby.*) The process of reproduction is very cheap?—It is merely the cost of photographing the map and laying it down on a stone.

669. (*Chairman.*) You have one other map, Sir Charles Wilson—you have got a new map, or an old map which is published on the scale of 4 miles to the inch?—I think the Committee ought to know the history of that map and exactly what took place; and if you will allow me I will read what occurred with reference to it.

670. Yes?—The history of the map on a scale of 4 miles to the inch is as follows:—

It was commenced in 1859, the intention being to produce a general map of the kingdom on that scale, from the original map on a scale of 1 inch to a mile. The southern and midland districts of England were reduced from the old 1-inch map, and engraved in outline, and the northern counties were reduced from the large-scale maps of those districts.

In 1872, when the new 1-inch map was authorised, the engraving of the 4-mile map was discontinued, partly because every engraver available was wanted for the new map, and partly because it was intended to delay the publication of the map until it could be thoroughly revised from the cadastral survey.

In 1884, the Director General of the Geological Survey wrote to ask whether the map could be completed for use by the Geological Survey Department, and stated "that even in the parts reduced from the old 1-inch Ordnance maps it is sufficiently accurate." In consequence of this letter, the engraving of the map was resumed, and, as its completion was for geological purposes, the cost of engraving was charged to the Geological Survey.

It soon became known that we had an unpublished engraved map on a scale of 4 miles to an inch, and in 1887 Mr. Stanford asked for transfers from the plates to enable him to prepare a map of England on that scale, to illustrate a series of papers on Archaeology for the Society of Antiquaries. Transfers of several counties were supplied to Mr. Stanford, and as the supply of a complete set would have been to publish the map in fragments, I determined to issue the map for sale with its known imperfections. I was the more induced to do this as the map of Ireland on the same scale has been very largely used for a variety of purposes.

It would have been throwing money away to thoroughly revise a map of this class before the completion of the new 1-inch map, and the engravers are all at present employed under pressure in finishing off the 1-inch. The only features revised up to date are the railways, which, on account of the sections of ground exposed in cuttings, are of importance for geological purposes.

To guard the public against the belief that it was a new map, a note was added to the effect that the map was reduced from the old survey.

671. Does that appear in repayment to your office?—That would appear in the 1,200l. that we take for engraving the Geological Survey. To guard against its being considered a new map, a note was printed on every sheet to the effect that it was reduced from the old survey. The map was completed for the use of the Geological Survey, and it was issued as an old map. We are not in a position yet to thoroughly revise the map, because the 1-inch map has not been finished. I have brought a map to show one of the uses to which the Irish map is put.

672. (*Mr. Roby.*) Do you not think it a little damaging to the reputation of the Ordnance Survey to produce an imperfect map of that kind?—Not when it is avowedly issued as reduced from an old map.

673. (*Mr. Mather.*) In what respect is it imperfect?—It is partly from a very old survey.

674. I know, but in what sense chiefly; not, I suppose, as to the levels?—The levels have never been completed, because it was not intended to publish the map so soon.

674a. But is it good enough for geological purposes?—It is good enough for geological purposes, and it was completed for them. The Geological Survey Department wished to have a black map on that scale on which to colour the geology; and the only detail brought up to date was the railways.

675. Ravines and deep valleys, natural configurations of a deep and important and imposing kind and so on would be on your maps, I suppose, correctly delineated?—No attempt has been made to show hill features.

676. (*Chairman.*) There is nothing shown but rivers. The rivers are shown.

677. (*Mr. Roby.*) No hill shading at all?—I have sent to Ireland for the manuscript drawing of the whole map—when we have engravers free we shall go on with the hills.

678. (*Mr. Mather.*) But it has been largely used for geological purposes, has it not, this 4-mile map?—Yes, and for geological purposes you must have black; you cannot have colour. For departmental purposes we use these maps largely. This is one of the maps of Ireland.

679. This map was really made for utilising in this way?—Yes, and eventually for a geographical map with hills.

680. Is this an enlargement?—This is the 4-miles-to-an-inch map of Ireland.

681. (*Chairman.*) I suppose this map itself did not really cost much to produce, because the work was all done before?—We only completed it.—I think that two or three sheets were incomplete, and we completed those sheets for the Geological Survey, and then when we found that the map was getting out piecemeal by the supply of transfers to Mr. Stanford we thought it better to issue it for general use in this way.

682. Have you produced a considerable edition of it?—No. It is an engraved map, and we only print a certain number of copies.

683. A couple of hundred copies?—I forget what the exact number was.

684. (*Mr. Roby.*) The colours here indicate geology, do they?—No.

685. (*Chairman.*) This is Ireland on the same scale? This is one prepared for departmental use, and it is largely used for that purpose. This is all Ireland. If for instance, one of the public departments asks us to prepare a special map, showing statistical or other information, we use this map, and in these cases small inaccuracies in roads and rivers do not matter. This will show the way in which the 4-mile map of Ireland will be completed. This is an unfinished proof; the hills are not finished.

686. Is that the 4-mile scale?—This is the 4-mile map of Ireland.

687. (*Mr. Roby.*) That is a different style representing the hill features?—This is not line engraving, but it is better for this scale.

688. (*Mr. Mather.*) It is very graphic.

689. (*Mr. Roby.*) There was one I saw of Ireland done about 50 years ago, which has the hills brought out in an extraordinary way?—Yes, but they are much exaggerated. This is now in progress.

690. (*Mr. Mather.*) Are you going to do the whole of Ireland on this plan?—The whole of Ireland.

691. On the same scale?—On the same scale.

692. (*Mr. Roby.*) This is a kind of mezzotint?—It is what is called triotint. It is done with a roulette on copper.

693. Would this be available for the 1-inch; is this more difficult than the line engraving?—There was a proposition that it should be used for the 1-inch scale some years ago, but it was not approved by the Director of the Survey at the time.

694. On the ground of expense?—I think on the ground of expense. This is the same sheet with contour lines, so that Ireland will be published in two styles.

695. Will it be much expense or trouble to bring out the maps of towns on the 6-inch scale in a similar way to this map of Cheltenham. This strikes me as just what one wants for a town, getting the town conveniently situated in the quarter sheet?—That is merely a question of time and expense,—whether the men should be employed on the preparation of special maps or whether they should go on with the pressing current work. There is no technical difficulty.

696. The time taken would be that of some of the special officers in your office, would it not?—Yes.

697. And it would be very skilled work, would it not?—No, it would simply be troublesome work joining the sheets.

698. It would not require to take away any of the time of the superior officers?—No.

The witness withdrew.

Adjourned till Thursday, 12th May, at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

THIRD DAY.

Thursday, 12th May 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Lieut.-Gen. A. C. COOKE, C.B., R.E.
Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.

SIR ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.
Mr. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Mr. HENRY TIPPING CROOK, Civil Engineer, 9, Albert Square, Manchester, called in and examined.

699. (*Chairman.*) Perhaps you would like to make a general statement to us before we proceed to examine you?—Well, sir, I did propose to do that, and the principal idea I had was to point out to this Committee how deficient we are in information with regard to the Survey. Of course the Director-General's evidence during the last two days has thrown a considerable amount of light upon it and made clear several points upon which I was still in doubt after my five years research into the matter. It seems to me that one of the striking difficulties about the Ordnance Survey is that Parliament knows little, and the public generally knows absolutely nothing about it. Owing to the differences and the changes that have been made in the modes and processes of production, the maps vary so much in value in different parts of the country that people hear attacks made upon the Survey on the one part which they think quite unjustified. For example, they have just received the new maps, as in the neighbourhood of Birmingham, where they have got a complete set of maps on all scales, the cadastral only

lately having reached them, and their maps are pretty much of one date. They do not see the defects which we in Lancashire have before us; for the last 40 years our maps have been gradually going down. We never had any true cadastral survey until quite recent times, in fact we have not got it yet for most parts of Lancashire, so we are in a better position to judge of the weak points of the Survey than people in other parts of the kingdom. I took some notes of the Director-General's evidence. I had originally proposed to go through the maps in the order in which they are put in the official reports, that is to say, beginning with the one 500th and working down to the smallest scale, showing the way in which they are utilised, and the defects which I and others think interfere with the full use of the maps. There are many things which might be remedied, as to which perhaps this Committee might see its way to making recommendations. Perhaps, if I went through on the lines of the Director-General's evidence first, before doing that it would be better. I was particularly struck with the first thing

Mr.
H. T. Crook,
C.E.
12 May 1892.

that the Director-General said about the comparatively trifling amount that would have been required, any time during the last 20 or 30 years; to have given us an independent 1-inch map—to have given us a fairly good topographical map of the United Kingdom, and we should never have felt the expense. If this process of reduction had never been adopted for the 1-inch map, apparently, from what the Director-General says—I was astonished at the evidence—a mere bagatelle of cost would have provided us long ago with a respectable topographical map of the United Kingdom, in which respect we are so much behind all other countries.

700. (*Mr. Mather.*) Were you alluding to the 2,000*l.* a year that he mentioned?—Yes; he says it would take 2,000*l.* a year to revise the 1-inch map. 1,700*l.* he mentioned for bringing up to date the 1-inch map; something less than 2,000*l.* would do that.

701. (*Chairman.*) May I point out to you this, that the old 1-inch map, although complete, is very imperfect in very large districts?—Quite so.

702. The new 1-inch map, is a perfect map barring its antiquity in certain places?—In certain places it is 30 years old or more.

703. (*Mr. Mather.*) So that the process which is perfectly practicable as regards the new series would not be satisfactory with regard to the old series, because some of it could not be corrected without re-surveying a very large area; and what is called the new 1-inch map is behind the age?—The whole of the northern counties, the south-eastern counties, Cheshire, Flint, and Denbigh, all the new 1-inch maps of those counties are more than 20 years old, and many of them much older than that.

704-5. (*Chairman.*) Will you please proceed?—What I was trying to point out was, that I was very much struck by that statement by the Director-General that 1,700*l.* would bring up this map, a large portion of which is over 20 years old, and many portions of it 30; that the expenditure of a few hundred pounds would bring it up to date, and give us a map practically as good as most of the topographical maps on the Continent. If that is sound—if that is a practical and possible thing to do for that very modest sum of money—it seems to me that a couple of thousand pounds a year devoted to that 1-inch map ought to have been set apart from the Survey Vote; if Parliament and the country had been made aware of it, there would not have been the slightest difficulty in arranging to make and maintain, separately from the rest of survey, the topographical map.

706. (*Mr. Roby.*) As I understand, the small expenditure that the Director-General spoke of is an expense which would be now required after the cadastral survey had been completed; it would not have been so small an expense if it had been done 20 or 30 years ago?—Allow me to point out that in the whole of the northern portion of England, where the cadastral survey was begun in the forties and finished in the fifties, the 1-inch is a reduction of a map which is 40 years old. The 1-inch map was not finished until 1870. I think the Director-General said, The original 1-inch map is now called a part of the new survey in that portion of England where it was never plotted on the 1-inch scale at all, but was obtained by a reduction from the cadastral map. The cadastral map, of which it is a reproduction and a reduction, is itself 30 years old, and therefore there is the whole of that area which would have to be brought up; also the whole of the south-eastern counties, the whole of Cheshire, Flint, and Denbigh. I am not sure, I am not sufficiently acquainted with other parts of the country to say whether or not in other districts also the new 1-inch map is at least 20 years old. When the cadastral survey, as Mr. Roby has just said, is finished, all these ancient pieces would have to be included in that portion which is to be brought up to date, and I should think it must be fully one-fifth of the area of England at all events which is so far behind and would have to be included. The 1,700*l.* was to make that good as well as all the rest of the cadastral survey, which has been reduced since 1880.

707. (*Mr. Mather.*) It would take four years to do it from now, you will remember Sir Charles Wilson said?—My point that I want to make is this, that if Parliament and the country generally had been aware that a couple of thousand pounds—or three thousand pounds, to take an outside figure—would, in ten years' time,

have given a map made by plane table, as that of France, based on the triangulation, and which I heard the Director-General say was quite as correct as ours for all purposes for which a map of that kind is used, there would have been no difficulty in obtaining that sum from Parliament. Even if it had had to come out of the cadastral survey, 2,000*l.* or 3,000*l.* a year out of 216,000*l.*, could not possibly have made a very material delay in the cadastral survey. When we are dealing with the cadastral survey, we are dealing with periods of 20, 30, or 40 years, so that six months or a year, more or less, would be no practical difference to the cadastral survey, if a portion of the grant made by Parliament had been separately allotted to the production of a 1-inch topographical map.

708. (*Chairman.*) I think that was a most important admission on the part of the Director-General?—That has been my feeling all along since I commenced the investigation of the Ordnance Survey. I think it is simply because Parliament has not been made sufficiently acquainted with these things. The reports are brought out in an exceedingly bald and dry way; they are repeated almost paragraph by paragraph. Some paragraphs are dropped for a few years and re-appear again. I could almost write the annual report of the Survey, leaving blanks for the work just done in any particular year with very little trouble. I could almost write it from memory; there is little or no information given to the public, which does not understand technicalities, and there is a good deal of mystification. My attention was very strongly drawn to this. Of course the Director-General is not responsible for what his predecessor did. The Director-General, after he was appointed, came down to Manchester in 1887 and delivered an address to the British Association, in which he showed the enormous importance and the benefit derived in geographical teaching by the use of the Ordnance maps, recommending that the children should be taught from the larger-scale maps and gradually introduced to the smaller, where the conventional signs came in. This tickled me immensely, and I thought it a very humorous thing, seeing that Lancashire had not got a cadastral map or a large-scale map of any kind; the best maps we had were from 40 to 50 years old. To recommend us to teach children geography from the large-scale map which we had not in existence really pointed out the weaknesses of the Survey, and very glaringly showed the defects and brought them home to us.

709. The Survey was all behindhand?—The Survey was all behindhand; we had no cadastral maps, and such other maps as we had were from 40 to 50 years old. With regard to the new 1-inch of the northern counties, a great many people do not understand that yet, because it is not at all clear from the reports. You had some difficulty in getting it quite clear in the Committee the other day, I noticed. There was a letter, which was published in the "Times" in 1885, signed "Wayfarer," complaining of the new 1-inch Ordnance map. Roads and private pathways closed up 20 years ago were still shown on the new Ordnance map. He thought—as I thought two or three years ago, when I wrote to the Director-General about it, and he was good enough to tell me and explain the matter—that there was an old 1-inch map of the north of England part of the original survey which is shown here in the catalogues. In the general catalogues of the Survey there is an index to the Ordnance map of England, and here are the sheet numbers, and then it says, "for the northern portions of the map refer to the index of the new map of England and Wales." Well, one would think that that map had been cancelled, and that this portion of the new map of the north of England was really a new map.

710. So it is in a sense?—But there never was an old one; it never had a predecessor.

711. It never had a predecessor?—There never was an original map, so I think it is quite a mistake and very misleading to call that a new map and to take credit for it, as is done regularly in the annual report, as so much work done on the new survey.

712. In fact, it is an error calling that a revision, whereas it is a creation?—No, sir; it is not called a revision.

713. They say now that the revision of the survey is proceeding in Lancashire and Yorkshire, or words to that effect; that revision being, in fact, the first plotting of the 25-inch scale?—Yes, on the 25-inch scale. But what I refer to is this, "The first sheet of the

See Wilson,
p. 218.

See Wilson,
p. 218.

" original 1-inch map of England and Wales was published on the 1st January 1801, and the last on the 1st January 1870. The new 1-inch map of England and Wales based upon the cadastral survey and published in two forms (1) outline and contours; (2) hill features), was authorised in July 1872." Now they seem to be making a fresh start. "The area published in outline is 40,657 square miles, and with hills 12,956 square miles. Of these areas 5,352 square miles in outline and 216 square miles with hills were published during the year." That is of the new map; credit is taken for the new map. It is distinctly called the new 1-inch map of England and Wales, and credit is taken for 12,956 square miles with hill-shading as work accomplished.

714. In addition to that, a certain quantity, also called a new map, which was published before 1870?—That is included in the 12,000; of that 12,000, 11,000 at least is the old map, for which credit is taken as being completed in 1870 in that previous paragraph.

715. Is that so?—At least 11,000 of that 12,000 is for the old original 1-inch map produced in 1870.

716. I did not think that that was the case?—It is so; you see it is distinctly called the new 1-inch map here; not new series; it is called new series on the sheets, I admit.

717. (Mr. Mather.) That means the same thing; the new series mentioned by Sir Charles and the new 1-inch map mentioned here are one and the same thing?—Yes, that is why it is called the new series, so that they could not be charged with deceiving the public with a downright misrepresentation. But in the report to Parliament—the annual report to Parliament—and every year this paragraph appears—it is a stereotyped paragraph, except for the alteration in the number of square miles—it is called new survey. Every year Parliament is informed of new work, of which 11,000 square miles were done previous to 1870.

718. (Chairman.) I think this matter of the 40,000 and the 12,000 does rather want clearing up. If Mr. Crook is quite correct, there is a great inaccuracy. "The new 1-inch map of England and Wales based upon the cadastral survey and published in two forms: (1) outline and contours; (2) hill features" was authorised in July 1872." The area published in outline is 40,687 square miles. The 1-inch map which now exists in Lancashire and Yorkshire is not based on the cadastral survey but the 6-inch survey; is it not?—A portion of it, sir, north of a line drawn from Preston to Hull, is from the 6-inch survey, the southern portions of those two counties are parts of the old 1-inch survey.

719. If it is so the paragraph is incorrect?—It was called the cadastral till quite lately. I am coming to that; there is another misconception about that—when I get to the cadastral survey.

720. Very well, pass on?—There has been a change in the *modus operandi* of producing this map, but it is not a new map. Then you see when the so-called new map was started they changed the names and the numerals attached to the sheets, still further misleading the public. I have one or two old sheets of these northern counties with the original index numbers when they were called the 107 north-east, south-east, north-west, and south-west, and so on. They were divided into quarter-sheets under the old system of numbers. There are maps in existence still with those old numbers on them; but the new map now begins No. 1 a little to the west of Berwick-on-Tweed. The old numbers were high numbers in the north of England so that people still think there is a new map. Many persons even who know the Ordnance Survey tolerably well have been misled by that, and think that this new series of the north of England is really a new map—therefore it leads to complaints against the Survey. If people knew the date the survey was made they would not bring such charges against it, for they would understand that the incorrectness was due to lapse of time.

721. The date is on every sheet when it has been made?—I have been hammering at that in my papers for some years, and my suggestion has been adopted, but the date is only now put on.

722. Is it only lately?—Only quite recently, and therefore it will be many years before all the sheets bear the date of survey; the present editions must first be exhausted.

723. I have an Ordnance map which has been in use for forty or fifty years, and that has got the date of 1828.

724. (Mr. Roby.) The date of the survey or the date of the publication?—It is only quite lately that the date of the survey has been put on every sheet—take the Aldershot sheet for example, or any of the south-eastern counties published hill-shaded of the new 1-inch map. The date is not upon them. The Aldershot sheet is printed from the electrotpe in 1889. If you will refer to the 6-inch map of Aldershot you will find it was surveyed about 1870 or 1871; that is to say, if you refer to the map of which it is a reduction, you will find that the new 1-inch map of 1889 is a reproduction of a survey made in 1870–71. The public does not know that. The public is misled by this: "Printed from electrotpe;" "Printed in 1889," or "Published in 1889," which is exactly the same with the lake district.

725. (Chairman.) There are the following words on this map (indicating): "Published in 1816 by Colonel Mudge. The Tower" ?—That applies merely to the old survey the original sheets of the old map which were plotted on the 1-inch scale. They were not reductions; it is in the process of reduction that the time is lost—for instance, the lake district. I think all England must have been surveyed by the fifties, and the lake map is published in 1865. The survey was finished, you see, before that—long before that. The cadastral survey of the lake district of England. But this Windermere sheet is, to all outward appearance, so far as the public can judge, of the date 1865. Really it is 10 or 12 years older than that. This is part of the new map.

726. You say the date of survey should be on every sheet?—I think that suggestion has been adopted lately. I noticed it on the new sheet; I noticed it on the sheet which the Director-General produced—a combination sheet of Brighton.

727. (Mr. Mather.) You mean the 1-inch survey of the whole country consists partly of the original 1-inch map started in 1801, and what is called the new series commenced in 1870?—The new series began in 1872, I think, to give the precise date. The first 12,000 miles of that map is a map which was completed in 1870.

728. You mean that it is the original 1-inch map begun in 1801?—It is the original 1-inch map begun in 1801.

729. That appears as part of what we call our new 1-inch map to-day?—It does.

730. Therefore it is very old, and the information is very old.

731. (Chairman.) That is not quite so; the survey of Lancashire and Yorkshire, and those northern counties, was begun in 1840, on the return of the surveyor from Ireland?—Yes, sir, that is so.

732. And they had no 1-inch map, or any other map, until the survey was completed on the 6-inch scale, then the 1-inch map was published, and the particular one that Mr. Crook is speaking of was published in 1865, although it might have been surveyed any time between 1840 and 1860?—Westmoreland was surveyed on the 25-inch scale; but allow me to point out that the 1-inch did not follow on the completion of the 6-inch of Lancashire.

733. No, but it was based on it?—It was not until the Committee, many years subsequently I think, recommended that those counties surveyed on the 6-inch and 25-inch scales should also have the 1-inch scale by reduction. There was a gap for a great number of years when the scale on which the survey was originally completed was changed; it was not in contemplation to continue the 1-inch map at all. It dropped in 1840, and it was not revived until after the battle of the scales, except that they went back to it during the battle of the scales as the original scale for the survey. They kept chopping about between the 6-inch and the 25-inch for some years. Then, when the battle of the scales was over, which lasted more than 11 years, that Committee—I think Lord Bury's Committee—the Committee of 1862, recommended that those counties which had been surveyed on the 6-inch or 25-inch scale should be reproduced on the other scales; that is to say, that the original work on which the survey started out in 1784 was resumed again, although the mode in which the map was produced was a different one from the original way. Of course the original idea with which General Roy started the Survey—the original map of the United

Mr.
H. T. Crook,
C.E.

12 May 1892.

Mr.

H. T. Crook,
C.E.

12 May 1892.

Kingdom—is not finished to-day; that strikes a foreigner as rather curious. The original enterprise for which the Ordnance Survey was constituted is not yet finished.

734. (Mr. Mather.) What is it?—A 1-inch hill-shaded topographical map of Great Britain and Ireland.

735. (Mr. Roby.) Portions, I fancy, have?—Portions of Ireland and Scotland.

736. (Sir A. Geikie.) The survey of Scotland has been finished?—The triangulation has been finished; there is no portion of the United Kingdom not surveyed.

737. These parts not completed, the making of these is going on?—Yes, slowly—one sheet was produced last year. There are 287 sheets wanting of England alone yet, so a simple calculation will show when they are likely to be finished.

738. You are speaking now of the new map; you can get a 1-inch map of the whole of England?—Yes, you can, but not of Ireland and Scotland.

739. You cannot get one of every part of Ireland?—Not with hill-shading. The outline map is finished and the outline map of Scotland was finished, a long time ago.

739a. (Chairman.) It is possible to get a 1-inch map of any part of England?—Yes, but not a topographical map—a map which shows the features of the ground as well as some detail of the roads and the artificial features; there is no complete map yet of the United Kingdom.

740. (Mr. Mather.) It is in connexion with that map that the small amount required for revision was mentioned, viz., 1,700*l*.?—My argument was this, if 1,700*l*. would bring England up to date; a large portion of it is 40 years old and other portions 20, and then perhaps three-fourths is much more recent, comparatively modern, but if that considerable area could be covered within a very short time and all the details corrected and filled in, as Sir Charles Wilson suggested, for 1,700*l*., if a grant of two or three thousand pounds a year had been made for a topographical map for the last 30 years, we should have had it and had it maintained.

741. Now begin from to-day; for instance, in the evidence we had from Sir Charles yesterday, he said this topographical map of the United Kingdom can be revised if they put on a special staff or increase the staff, and spend money under 2,000*l*. a year for the next four years. You heard him say that yesterday, did you not?—Oh, yes, certainly.

742. That would complete the map?—In 1910 he says now.

743. No; he said in four years?—That is outline, but not the hill-shaded. This photo-zincographic advanced edition is merely a stop-gap; it was produced recently; it was only decided upon last year. I think it is in consequence of the agitation and these defects being pointed out that that edition has come out. What I am rather afraid of is that if we do not look out very carefully the Treasury will take this photo-zincographic advanced edition as an excuse for never finishing the original enterprise.

744. (Chairman.) The word “topographical,” that you have used, is satisfied in its meaning by a map in outline showing roads, rivers, and places, but without hill-shading?—I think not, sir, without hill-shading; I should not say so.

745. The word “topographical” would be satisfied in its true meaning by a map representing the road, rivers, and places correctly of any country?—I should not say so, not in the modern acceptance of the word.

746. You limit the word “topographical” to a map which, including those features that I have mentioned, also shows hill-shading?—Yes, I do, sir.

747. By the contours?—Some mode of indicating the forms of ground.

748. Until a map shows the elevations of ground it is not a true topographical map?—That is the interpretation I put on the words “topographical map.” The Germans call it—what you may call the horizontal portion of the map—the Germans call the “situation,” the French “the planimétrie,” of the map. They have a word for what may be called the horizontal development of the ground and the objects on the surface of the earth; both the French and Germans have a proper word for it.

749. And if a Frenchman wants to describe a topographical map in your sense, what name would he apply to it?—They would apply the same word, “topographical”; the French word is practically the same word.

750. I want to get a true definition of words so that we may not be falling out over words when meaning the same thing?—Yes.

751. (Sir A. Geikie.) Do you think that is an ordinarily understood use of the word topographical?—I think so amongst men who are accustomed to use maps.

752. I use maps, and it is a definition I never heard before.

753. (Mr. Roby.) The outline maps as now published, whether engraved or photo-zincographed, show contour lines?—But they are so fine you cannot read the ground.

754. Those you think are not sufficient, for your idea of a topographical map?—In moderately undulating country they give no idea of the ground at all. That (referring to map) is a country full of deep valleys and gorges.

755. (Chairman.) Will you proceed?—Then I understand the Director-General to say that really the resumption of that 1-inch map, and the production of what is called the new series was consequent upon the war of 1870, when the British War Office awoke to the fact that a topographical map was part of the necessary equipment for national defence, and that we had not an adequate topographical map of the country, and therefore it would be well to produce one from the cadastral survey—a new one, and that was the origin I understood him to say of the new series 1-inch. Then, in the outline 1-inch there is one thing I should like to point out—few contours are given upon it.

756. Are you speaking now of the 1-inch map?—The new 1-inch map, sir. In the south of England, wherever there is anything in the nature of a fort, the few contours, poorly as they define the nature of the ground, are dropped. They are dropped when they come near a fortified place. Even at Newhaven you will find the contour lines dropped about a mile and a half on each side of Newhaven town. It seems to me that that is a very foolish notion. Any intelligence department of any foreign country could easily fill in the gaps in these contours if they wanted them. Their absence spoils the map.

757. Do you know what the practice is in Germany?—They do not show forts or fortresses, at least not new works. I have one I bought in Metz last year. They provide those maps; you can buy them in any German garrison town, and they sell them cheaply; Here (producing map) is a contoured map of Metz which I bought in Metz last year. The forts are not put on, but if you buy a French map of Metz, you find the German fortifications. On the sheet before you every hill is contoured. Anybody can put the forts on if they like.

758. (Mr. Mather.) He knows where they ought to be?—He knows where they ought to be. You can take a walk round and mark them on, but I would not advise anybody to try it.

759. (Chairman.) Which is the better map—a map which omits a fort, or a map which omits the contour lines?—I think the maps which omit the forts.

760. Because forts can always be put on afterwards?—At the War Office those details can always be added. If a map is made for defensive purposes it surely ought to show the form of ground about the very point that would be open to attack. They drop the information where it would be most valuable.

761. In England are the forts included. Contour lines are omitted?—The battery at Newhaven is not put on. It is a fort at Newhaven; it is not on the new 1-inch sheet, but I propose to return to the contouring when we get to the investigation of the detail of the maps.

762. Would you call this topographical (referring to the map of Metz)?—Certainly, because there you can get the features of the ground quite clearly, although there is no hill-shading. It is a little difficult to read that map, because it is all in black.

763. (Mr. Roby.) Then in that respect it compares with this engraved Ordnance outline map?—Only so far as printing in black is concerned, for it has a great many more contours, and those contours can be seen.

See Wilson,
p. 218.See Wilson,
p. 218.

764. (*Chairman.*) What is the scale of that map?—
about 1½ inch to the mile.

765. (*Mr. Brickdale.*) You could make a topographical map either by contours or by hill-shading; but you mean that it should appeal to the senses?—Yes, certainly, I have a topographical map here; that is a topographical map (*showing contoured sheet of Carte de la Frontière des Alpes, 1866*).

766. (*Chairman.*) I quite understand what you mean by topographical?—In this Frontière map the ground is shown by contours, except where it is too steep to be indicated by that method. The very steep slopes are shown by hachures.

766a. (*Chairman.*) What is the next point?—I propose to turn to the cadastral survey. I have been much surprised by the amount of money that has been taken for it. We could do with a good deal more information upon the enormous cost of the cadastral survey.

767. You think it excessive?—I cannot understand why it has cost so much, or the basis upon which the estimates were made. It does not seem to have been carried out for the estimates, because Sir Henry James told the Committee of 1862 that if he had 90,000*l.* a year he could finish the cadastral survey in 21 years. The Committee recommended 90,000*l.* a year on that account. Sir Henry James undertook to complete the cadastral survey over the whole of the British Isles in 21 years from that date.

768. (*Mr. Mather.*) What date was that?—That was the Committee of 1862. Lord Bury's Committee I think it is. The Report is entitled, "Report of the Select Committee on the Cadastral Survey, 1862." Sir H. James further stated that if he had 150,000*l.* a year he could complete it in 12 years from 1862; that is in 1874. We should have had the cadastral survey completed by 1874 if 150,000*l.* a year had been granted; and by 1883 if 90,000*l.* was granted. But not only has 90,000*l.*, but more even than 150,000*l.* has been granted for many years. Even if you take 12 years at 150,000*l.*, it is a very much less sum than has actually been expended on the cadastral survey. We heard yesterday, or the day before, from Sir Charles Wilson that the vote at one time had been up as high as 270,000*l.* It is very difficult to understand what has become of all that money if the estimates of Sir Henry James were at all reliable. Then the separate cost of different maps is one of those things we cannot get at. It is quite a revelation—this very low cost of the 1-inch topographical map—quite a revelation to me, Sir Charles Wilson's evidence on that point. I had no idea what proportion of the total grant was required for the small-scale maps. I think it would be better for Parliament to vote the amount for each map separately and make it inalienable—ear-mark it for a particular map. I should put it in this way: Parliament says to the Director-General we want such-and-such a map; we want it completed in the shortest time that you think it could be properly done; we want to know what it will cost, how many years it will take, and then we will vote that sum of money every year till the map is finished, but it is set apart for that map, and not to be taken for any other purpose. Sir Charles seems to lay stress upon the point that the 1-inch map had dropped behind because every penny of money was wanted for the cadastral, but it was such a trifling amount that was wanted for the topographical that it could easily have been spared from the cadastral.

769. (*Chairman.*) The reason why so small an amount was wanted is due to the change of form, viz., publishing by photo-zincography instead of by engraving. When he spoke of that sum of 1,150*l.* yesterday for the production of this advanced edition, the reason why so large a portion of the country will be covered at so small a cost is due to there being no engraved plates produced?—But the 1,700*l.* odd pounds—call it 2,000*l.* for round numbers—is not wanted for that purpose, but for correcting the 1-inch map; it is principally for field operations, surveying really, which Sir Charles Wilson proposes to carry on quite independently of the revision of the cadastral survey, simply to send surveyors into the field to survey those objects which it is necessary to put into the 1-inch map. You can easily understand that what is to be shown on the 1-inch map is a very inconsiderable amount in comparison with what is to be shown on the cadastral survey, and the number of measurements to be taken are comparatively few.

When you have got your minor triangulation completed the sketching in of the detail on the 1-inch is a pretty rapid process if it be done by plane table as it is done in nearly all continental nations. I think the new vicinal map of France was only commenced in 1875, and I believe it is practically completed now. Thus it has taken 15 or 16 years to do the whole of France. The area of France is greater than that of the United Kingdom, nearly twice as great, I think.

770. (*Mr. Mather.*) There have been statistics published under the heads of revision of the cadastral survey, and so on, in connexion with the vote; for instance, in 1886-87, 189,000*l.* went to the cadastral survey, under the head of revision 5,000*l.*—you are acquainted with those figures?—Oh, yes, I am familiar with those figures. I have all the estimates here for a number of years back—the estimates for the Survey presented to the House of Commons.

771. Your point is, how is it that 190,000*l.* practically is spent here in one year, probably for several years,—something like that—and yet only 90,000*l.* had been originally estimated by Sir Henry James to complete the whole thing in 21 years?—That is my point. As one who has investigated the subject, I should like to see some explanation of that point.

772. You think the Committee ought to know something about it?—If the cadastral survey in 1862 could have been completed in 21 years years, for a steady grant of 90,000*l.* per annum—

773. That statement being made in 1862?—You see that it was not done.

774. We are in 1892 now, 30 years afterwards, having spent a great deal more than 90,000*l.* per annum, and we have not got the cadastral survey completed?—We have it completed in the sense, Sir Henry James.

775. How long has it been completed in his sense?—That is another point where there is mystification. It was explained very clearly by Sir Charles Wilson that when Sir Henry James estimated that he could complete the cadastral survey in 21 years if he were granted 90,000*l.* per annum, he did not include those counties which had been surveyed on the 6-inch scale, they have never been included in the estimate for completing the cadastral survey, the 6-inch survey having been called a cadastral survey in those counties. When there was an agitation for the completion of the cadastral survey, somewhere about 1880, I think the Treasury had a committee on the subject, it was estimated that it would cost about 1,800,000*l.* to finish the cadastral survey. When the House of Commons was asked to vote a sufficient grant each year to enable the work to be completed by 1890, it voted it, I take it, on the assumption that the cadastral survey was really going to be completed. That the 25-inch map was going to be completed at all events for the whole of England and Scotland, and I think I am borne out in that by the Report of 1887, wherein it is stated "under existing instructions the under-mentioned maps and plans are being published," then a list is given, (1) town plans, (2) parish plans, (3) county maps, and (4) a topographical map on the scale of 1-inch to a mile, and then it says, "the publication of the first three is to be completed by the 31st of March 1890."

776. (*Chairman.*) That is the 1-inch, the 6-inch, and the 25-inch?—No, sir; the town plans, the 25-inch, and the 6-inch to be completed.

777. (*Mr. Roby.*) Not the first three?—"The publication of the first three is to be completed by the 31st March 1890."

778. It does not include the 1-inch?—No; it does not include the 1-inch; but it includes the town plans. I was writing to a local paper about the state of the survey at this time, and as the survey was then going on in Lancashire—the minor triangulation had been all set out again for the 25-inch—I assumed that that was part of the cadastral survey, never having seen a cadastral map of Lancashire; so I mentioned in that letter that I could not understand how the cadastral survey was to be completed in the year 1890 when in the year 1888 the surveyors were actually conducting the operations in the field; and I pointed out that in Lancashire and Yorkshire there were some dozens of towns, perhaps more than a hundred towns of more than 4,000 inhabitants, and I was well within the mark in saying that much had not been begun. Manchester was just begun then. I said I did not see how the

Mr.
H. T. Crook,
C.E.

12 May 1899.

See Wilson,
p. 219.

See Wilson,
p. 219.

Mr.

H. T. Crook,
C.E.

12 May 1892.

cadastral survey was to be finished in the year 1890, when in the year 1888 the surveyors were actually conducting operations in the field. I wrote to Sir Charles Wilson to ask him the solution of this problem, and his letter to me in reply—this was of course merely a private correspondence—I asked him for a solution of the mystery, and he said for some reason or other the Treasury has classed the re-survey of Lancashire and Yorkshire as revision. But this, I think, is most misleading to say you are going to complete three maps of England and Wales within a certain date on three different scales, when really you have no intention of doing the important counties of Yorkshire and Lancashire.

779. (*Mr. Roby.*) Would it be right to say that by the completion of the cadastral survey was meant the completion of the 25-inch survey in all those parts of the country which had not been surveyed on the 6-inch?—Yes, it would, and it should have been so stated, instead of which it is put in here “Parish plans on a scale of 25·344 inches to a mile ($\frac{25344}{1000}$) of the cultivated districts in all counties, the county map on a scale of 6 inches to a mile ($\frac{100000}{1609}$) in two editions, one with the other without contours; town plans on a scale of 126·72 inches to a mile ($\frac{12672}{100}$), of all towns with more than 4,000 inhabitants. The publication of the first three is to be completed by the 31st of March 1890.” That looks as if the parish plans of Lancashire and Yorkshire were included in the estimate for the completion of the cadastral survey.

780. I think the term cadastral is used by the Ordnance authorities sometimes for the 6-inch, though more frequently for the 25-inch?—That is rather what I complain of. Parliament voted this money to complete the cadastral survey, thinking it was going to have 25-inch maps of the whole of England and Wales, and I thought so too. I thought the object of the increased vote from 1880 onwards was to give us 25-inch parish maps throughout the whole of England and Wales by 1890, and that was what Mr. Shaw Lefevre, the Minister responsible at that time, also thought, quite clearly.

781. (*Mr. Mather.*) Sir Charles yesterday confirmed the statement that the survey should be completed in 1891 by saying it had been done?—It had been done. Oh, yes, the publication was to be completed by 1890. It was completed in 1891 Sir Charles Wilson said, I think.

782. That of course includes some 6-inch scale in the cadastral survey?—It must do, because we have not got the 25-inch maps of Lancashire and Yorkshire yet.

783. (*Chairman.*) There was no intention to mystify, but the gentlemen who used those phrases had fully in their minds what they meant; for now we come to look at it after a number of years, we do not quite understand what they had in their minds, and perhaps we may be mystified?—Parliament and the public were mystified; that is the point.

784. I expect it was known then?—I do not think so, because Mr. Shaw Lefevre did not understand it.

785. We cannot say that, I think, in this sense. Mr. Roby has just said that the map was completed in the sense that all portions which had not been surveyed on any large scale would be completed in 1890, that was understood; I do not think we must impute motives?—I do not want to impute motives, far from it; I do not want to impute any motives at all.

786. I agree with you entirely that we are at the present moment confused by the use of this word revision in the sense in which it is used; we have all been confused?—I noticed it was some time before the Committee got it clear—the cadastral survey—the change in the use of the word cadastral for the 6-inch and the 25-inch.

787. (*Mr. Mather.*) It has been applied to two distinct maps—surveys?—It has been applied to two distinct maps—surveys. What I want to point out with regard to the evidence which Sir Charles Wilson gave is this, that if the public and Parliament had known of the state of affairs we probably should not have had the survey in its present backward position, because they would have realised fully what they were doing. It is so difficult to arrive at the facts. Then the revision of Lancashire and Yorkshire authorised in December 1886. That revision on the scale of 25 inches really is not a revision, it is a re-survey. These counties never have been surveyed on that scale before,

and I contend that it is another mystification to put it in the estimates as revision; it does not let Parliament see what is being done. Parliament has got the opinion that the cadastral survey was completed, and that this large sum of money is being devoted to revision, whereas it is not.

788. (*Chairman.*) I think we need not labour this point; at present we do understand it?—The only thing is whether it would not be better to state the actual amount for revision and the actual amount for conducting the re-survey of Lancashire and Yorkshire separately. What I want to bring out about the estimate is that at the present moment it has been reduced; the amount of money which has been expended in England and Scotland has been reduced in order that more shall be spent in Ireland; a new work has been undertaken in that country without being brought before Parliament; it has been authorised, this enormous work, which is to last 20 or 30 years. The revision of Ireland on the 25-inch scale has been recently undertaken, and Parliament has never been made acquainted with it; no estimate has been made for it.

789. (*Mr. Mather.*) You do not mean the revision?—Well, it has been called revision; it is really re-survey.

790. Re-survey?—It makes it very confusing.

791. It has been commenced, but it will take 20 years to do?—On the recommendation of Sir Charles Wilson, who sent in a memorandum to the Royal Commission on the Irish Land Acts, a re-survey of Ireland on the 25-inch scale has been begun, and no special provision has been made for it; it has not been brought before Parliament, as far as I am aware; what this survey of Ireland on the 25-inch scale is going to cost; of course it is more costly than revising the 6-inch map already in existence. They are cutting down the revision work in England and Scotland to get sufficient money out of the grant to re-survey Ireland on the 25-inch scale. Therefore it comes to this: if we ask for money for true revision work in England, which has never been granted yet, money to revise the maps and bring them up to date, it will look as if we were asking for more money than we really are asking for; because they have entered a new work under the head of revision, which is a separate and distinct work, and ought to have been charged separately and distinctly.

792. (*Mr. Primrose.*) As a matter of fact, at the present moment there is no revision proper going on at all?—No, practically no revision.

793. There is nothing but re-survey?—I think there was a small sum granted by the Treasury one year for what they called experimental revision.

794. Was that for the re-survey of Lancashire and Yorkshire?—No. There was a small sum granted by the Treasury one year for what they called experimental revision, which was really revision.

795. It was really revision?—That was, I suppose, to test what would be the cost of it. The general public, or anyone interested in the matter like myself, looking at the estimates would draw the conclusion, unless they knew something about it, that this year 138,000l. was to be voted by Parliament to bring these maps up to date, whereas nothing is asked for, apparently, for real revision work.

796. (*Mr. Mather.*) Concerning this revision of course the recently surveyed portions of the country would not require revising for many years to come?—The quite recently surveyed?

797. Yes, the conclusion for instance of the 25-inch survey would in itself be complete?—Well, we come later to the matter of how the revision should be conducted, which is another branch of the inquiry.

798. I know; speaking of the revision, you are now going back to the beginning of these surveys, are you not; you have that in your mind?—To the beginning.

799. Taking the maps which are now in existence—the survey which was conducted many years ago—you would have to begin at the beginning, would you not?—Oh, yes, of course.

800. Take 1870, when the new series came out. There has been nothing done to the 1870 maps since these came out?—No, and earlier than that; if we were to wait for the revision of the cadastral survey before revising the 1-inch, the revision of the 1-inch would be practically a hopeless matter.

See Wilson
p. 219.

Wilson, 219.

801. At what periods would you suggest that revision should be made?—I thought we would deal with that later on when we came to the revision head of the inquiry. About the 6-inch map it is said to be completed now I think, I do not know that it is completed, it was not so quite recently; the contoured sheets were not to be obtained for the whole of England. The question is are they to be obtained by the public, because you see they publish an advanced edition or an earlier edition without contours. I think they are rather anxious to get that edition off before we can buy the contoured edition. I know as to portions of Lincolnshire quite recently it was not possible to get a contoured 6-inch map down about Skegness.

802. (*Chairman.*) Do you say they wanted to get rid of the uncountoured edition first of all?—They printed a certain number of copies without contours; they sent out an incomplete map; it was so quite lately with Carnarvonshire—the Ormes Head—which is in Carnarvonshire. The adjacent part of the map which is transferred from the Denbigh sheet is contoured, while Llandudno and the Ormes Head were not contoured; one portion of the sheet is contoured and the other not.

803. They can get them all now I am told?—I was not aware of that.

804. And my experience is this, I wanted several contoured sheets last January, and I got them all but one, and I was told that I could not get that one. I have spoken to Major Johnston, and he has produced to me that contoured sheet which I could not get; that is the fault of the publisher apparently—I mean, Stanford. I am speaking of the 6-inch map?—Yes, if Stanford has the contoured sheets.

805. "It seems to me the reason why I did not get what I wanted was Mr. Stanford?"—I think that would rather bear out my point; whoever is to blame for it, it comes out very often that the public cannot get the contoured sheets. Then there is one very striking fact, Sir Charles Wilson brought out, and that was the popularity he calls it, I think, of the outline as against the hill-shaded 1-inch maps. I was very much puzzled with that, and I could not believe it possible, but my explanation of it was partly that the hill-shaded series is not complete. The hill-shaded map of Scotland, for instance, for Oban and that district, you could not get until the last year or two, but you might get the sheet next to it, and if anyone wants a set of maps, he would not have one outline sheet and three hill-shaded sheets. The outline map of Scotland has been ready for a long time, and a person who wanted several sheets would buy sheets of a similar kind, and not have three hill-shaded sheets and one not. I wanted a sheet of Ireland for walking purposes from Dublin to Wicklow—the Dublin sheet and the North Wicklow sheets were published—but the Arklow sheet, I think, is not published yet, according to the last report, and in the mounting of the map of course it looks very absurd. The Arklow sheet is not yet published hill-shaded. If you want the strip of that pretty country on the east coast of Ireland—Wicklow—you cannot get the three sheets of the same style to mount together to make a complete tourist map even yet. It was in 1880 that I got that map, and I had to get an outline sheet to make up with the two others; that would account for a considerable amount of extra popularity for the outline map, it seems to me. Sir Charles Wilson pointed out another cause, that for statistical and for administrative purposes they would be more used.

806. (*Mr. Roby.*) Business purposes?—Yes, that is a thing we should not lose sight of in making maps to keep in mind what they are designed for; each map ought to have certain uses. In most continental nations they produce a military map, they produce civil maps, and they produce very often geographical maps for all educational purposes, and each map carries the information which would be of the most benefit, and most useful to the class for whose use it is designed.

807. (*Sir A. Geikie.*) It is a fact, is it not, that in Scotland the hill-shaded maps are by no means so popular as the others, even in districts where they have had both series of maps for a long time?—So Mr. Stanford says.

808. The same story has been told by the agents in Scotland that for one map of the hill-shaded series they sell 20 of the other?—Yes, it is a very extraordinary thing.

809. (*Chairman.*) For your own feeling you would prefer a hill-shaded map?—Certainly, for all tourist

purposes; for walking purposes. If I want to understand the country, the ground, and the scenery I would much rather have a shaded map, and I think these hill-shaded maps of Scotland, so far as the hill features are concerned, there is nothing like them in the world; they are really remarkable achievements in the way of hill-shading.

810. I should like to know what is the feeling among those who buy skeleton maps instead of hill-shaded maps?—I know a good many people who take an interest in and buy maps, and I think the preference for the outline may often be attributed to the prevailing low taste in cartography in this country.

811. (*Mr. Roby.*) Are the names very legible on the Scotch hill-shaded maps?—No, the names are not very legible.

812. Do you not think that is one of the causes why people prefer them because they can see the names?—Yes.

813. I have found in the Lake District, with regard to the maps of the Lake District, that persons of a scientific turn prefer the contours?—It all depends for what purpose you are going to use the maps of course.

814. Even for walking purposes?—Yes, that is possible, if you get off the beaten track; if a man gets a contoured map he can follow the contour line and find whether it is possible to maintain his level without losing ground walking round a hill side. From a hill-shaded map, unless he were a very accomplished map reader, he would not get that information.

815. (*Mr. Mather.*) Did you see that hill-shaded map of Ireland we had yesterday?—Oh, yes, that is a beautiful thing.

816. (*Chairman.*) Would you suggest upon this point, Mr. Crook, that we should advise in accordance with the popular taste, namely, that the maps should not be hill-shaded, but only sold contoured?—No. I think you are providing for two classes of people two different maps. You ought to have a hill-shaded map, and you ought to have a contoured map. It is possible to have a combination of hill-shading and contouring like some of those specimens which Sir Charles Wilson has laid before the Committee.

817. Considering the expense of hill-shading, and the apparent unpopularity of it, you would not advise the omission of hill-shading?—Well, I would put it in this way: if the Committee were prepared to recommend a sufficient number of contours to give an accurate delineation of the physical features of the ground, I should say abandon the hill-shading; if you could get a map which would give you sufficient contours to show the shape and formation of the ground clearly, I think people would probably understand them better than hill-shading, and they would serve the purpose of those who wanted a contoured map and those who wanted a hill-shaded map.

818. Did you hear Sir Charles Wilson state the cost of instrumental contouring yesterday?—Yes, sir, I did. I propose to deal with that when I come to the 6-inch map, because that is a very material point when you think of the engineering uses of contours.

819. (*Mr. Roby.*) You have no doubt, Mr. Crook, that the hill-shaded map is the only one which would give the general public an idea of the nature of the ground, have you?—If only one method of showing ground forms is to be adopted, I think it is the only one. Hill-shading gives a pictorial, contouring a mathematical, representation of the ground. The general public understands the pictorial better than the mathematical, but there is no reason why the two should not be combined.

820. (*Mr. Mather.*) Did you say that in France you could buy a map hill-shaded, contoured, or plain, just as you required it?—Yes, you can buy it any way; you can buy a portion of the map of France with all the rivers, the canals, and anything to do with water on a sheet by themselves, all given distinctly; they publish it in so many different forms. There is a water map, a railway map, a road map, and those who want them for those particular purposes can have the impressions of the map, on which they will find the information they are particularly interested in. They can add anything in the way of sketching in detail or works that they want to show on it themselves in manuscript without confusion.

821. What can you buy here?—You can get nothing but the outline 1-inch map.

Mr.
H. T. Crook,
C.E.

12 May 1892.

822. Would you advise that ours should be the same as the French?—I do not know whether there would be sufficient sale to justify three or four different kinds of map. I should have to think that over rather carefully again, because I have been surprised to learn the small amount required to produce the smaller-scale maps, now the great triangulation is finished and the cadastral survey practically or very nearly finished for England and Scotland. In Ireland you have the 6-inch from which to get the 1-inch. The cost of producing any class of topographical map seems to be a bagatelle in comparison.

823. Can you buy such maps in Germany also?—I do not think so. The position of Germany is peculiar in this way: you see it united a number of different countries all of which had a different series of maps previous to the unification of the German Empire. Now the Germans are producing a new map which is not finished yet; they are producing a map on the scale of $\frac{1}{250,000}$ which is contoured and hill-shaded both and which gives every possible rise and fall of the ground that could hide troops throughout the country. It is perhaps the most accurate delineation of the formation of ground that has ever been undertaken by any country and from that they are producing a 1/100,000 about two thirds of an inch to the mile, but on the latter the contours are omitted.

824. (Chairman.) These French maps you spoke of, are they engraved maps or produced by any other apparatus?—I do not know how they are produced; I am not sufficiently acquainted with the technicalities of methods of producing maps to say with any certainty the exact methods adopted.

825. (Mr. Mather.) You do not think the publication of our maps in the same form as the French would be justified by the public utility of it?—I think it would now I know that the expense is so comparatively small.

826. It would be distinctly better to have such maps?—Certainly for educational purposes as well as scientific purposes.

827. It would be a great public utility to have the maps published in that form available for any question that might arise?—Certainly. There is a map produced by the Ordnance Survey showing all the river systems of England on the scale of 10 miles to the inch. Of course that is rather small for showing all rivers and canals, it is not very complete or accurate, and it is enormously expensive.

828. (Mr. Roby.) For this special purpose that you are speaking of, such as you find convenient in France, would not photo-zincography be sufficient?—Oh, quite sufficient; they would not need to be engraved.

829. (Chairman.) Have you any particular question just to finish with?—Well, sir, since hearing Sir Charles Wilson, I would say I am more strongly than ever of the opinion that the cadastral survey and the cadastral revision should be cut adrift altogether, and separated from the 1-inch topographical map. I have for a long time had that opinion, and that Sir Charles Wilson says is the mode abroad. The triangulation is one department, the cadastral is another, and the topographical is a third.

830. (Mr. Mather.) Can we keep to the word survey in relation to this matter on our notes, because we will get into the same confusion as members of the House who take revision and survey to mean the same thing. Mr. Crook used the same words survey and revision?—I mean the survey on the 25-inch scale, and the revision of that survey should be kept quite distinct, cut adrift altogether from topographical productions.

831. (Chairman.) He is confirming the suggestion Sir Charles Wilson made to us that the revision of the topographical map should be kept separate from the cadastral?—Well, then there was a question about the engraving, sir, engraving the whole map. Sir Charles Wilson said that the difficulty was to get engravers, and that engraving was rapidly becoming a lost art, I think, considering the time the Survey has been in operation, I cannot see why there should have been any difficulty in training a school of engravers, seeing that Germany can get maps engraved. They are producing a new map in Germany. If engravers were offered regular employment, there ought not to be difficulty in getting a sufficient staff. In the report of the correspondence with the Treasury and Sir Charles Trevelyan, presented to Parliament in 1854, there is a memorandum by General Colby, when he was

Director of the Survey, pointing out the importance of doing a topographical map, or hill-shaded map, quickly, and if it were completed quickly, as soon as he could train the engravers, it would be done more cheaply and more uniformly; that one of the great defects of our maps is the want of uniformity, one portion of the kingdom being so entirely different from another. General Colby said he had only about six men at that time who could do the thing properly, and he proposed to bring up a few more to it, and when these were trained up, and got into operation, he could do a hill-shaded map of Scotland in 11 years. I think he said that to Lord Elcho's Committee also. Previous to the appointment of Lord Elcho's Committee he had said it was necessary to train people up to it; and, if he were certain of a steady grant of so much per annum, that in about 11 years he thought he could do a hill-shaded map of the entire area of Scotland. It seems to me that if you could insure employment for engravers, there ought to be no difficulty in getting men to undertake it.

832. You do not know that there are persons willing to accept employment as engravers who are competent?—I know that where there is steady employment ensured plenty of young men would be willing to be trained up and go into any trade or craft. The same difficulty arose in General Colby's time. It is not owing to these new processes of photography and other methods of reproduction, for the difficulty about engraving arose long before these new processes came out. I do not see that it is consequent upon these new processes—the decline of engraving. The difficulty was pointed out by General Colby, who was a very able Director of the Survey; he was for some 20 or 30 years in charge of it, and those were the palmy days, I should have thought, of engraving. He had the same difficulty then. It is a special art which requires men to be specially trained for it. If it is impossible to procure engravers, and it is impossible to get men trained for it, there is no use in proceeding with this hill-shaded map, and producing only two or three sheets a year. That is the reason why I wanted to bring forward the question of engraving, if we were going to proceed, as we have hitherto proceeded, with this appalling slowness of production as General Colby called it—he used that phrase, I think, in 1840—

833. But the Ordnance Survey are producing more than two or three sheets a year?—Well, I think, three or four of Ireland, a couple of Scotland, and one of England.

834. I do not think we have had precise evidence yet as to the quantity?—Well, in these reports the number of sheets produced in any one year is always given.

835. (Mr. Roby.) I think the fact is that they have not laid any stress upon the hill-shaded map for some time, consequently they have not exerted themselves.

836. (Chairman.) They have 16 engravers?—He gave us the proportion of them.

837. (Mr. Mather.) Sir Charles Wilson gave no evidence to prove that he could not get more engravers.

838. (Chairman.) He said the art of engraving was dying out—killed by the cheap process.

839. (Sir A. Geikie.) Surely that is a fact.

840. (Chairman.) That is his statement. The Ordnance Survey could get no outside help; they could only get engravers by training them themselves?—It rather bears upon the point you were putting to me before luncheon, sir, whether one would say that the hill-shaded map should be continued if you cannot get engravers. If you cannot get engravers do not go on at the present slow rate, but give it up.

841. (Mr. Roby.) Sir Charles Wilson expected to complete the hill-shaded map by 1910?—By putting on extra pressure.

842. (Mr. Roby.) Which implies that he would get greater rapidly than at present?—He must then be able to get more engravers.

843. (Chairman.) The man who engraves the outline map would be less competent to engrave the shading?—General Colby had the same difficulties to face 50 years ago, and he said then, it is special art; you have to train men specially for it, and he pointed out the difficulties of the question, and we seem to be in the same position to-day pretty much. If you cannot get engravers, there is no use going on with the hill-shaded map.

845. (*Chairman.*) Please proceed now, Mr. Crook?—Then Sir Charles Wilson has made it perfectly clear in his evidence the essential difference between the foreign method of surveys and our own.

846. And you agree?—Generally; our system is totally different from theirs. Foreign nations do not publish their cadastral plans as a rule; it is a question of expense; as he pointed out, it was simply a matter of whether the publication would pay for itself; and Sir Richard Griffiths, who was chief valuer in Ireland at that time, seemed to think that, when the cost of copying or tracing was given to him, it would be cheaper to engrave the maps.

847. Do you think our system is the better system of the two?—I think so. If it pays, as Sir Charles Wilson says it does pay, I do not see why that difference should delay the survey very much.

848. We get 13,000*l.* a year, apparently, towards the expenditure?—You are having a cadastral survey made. The only difference between ours and foreign nations is that they do not publish and we do. It is only in the expense of publication. Well, there Sir Charles Wilson says that the sale of maps covers the cost of production.

849. Yes?—Of those large-scale maps.

850. And it is very much more convenient for the public?—And it is very much more convenient for the public. There is a large sale for those maps, and they are a great convenience, an advantage which we have over Continental nations.

851. In that point we do get some consideration for our expenditure?—Yes, but the cost of the foreign cadastral is hidden away altogether. It looks as if we were spending a much greater sum of money on our national survey than foreign countries. In France they have a topographical survey for the army; then the Minister of the Interior produces another map. There is a whole series of maps produced by the Geographical Department of the army; and then there are vicinal maps produced by the Minister of the Interior; then there is the cadastral, which is by the Land Department. It is divided so that no one can see the total cost of either the French or the German national surveys.

852. I suppose you have no information upon that point?—I have no information at all. I only want to point out that in our case being put together, these three things which are kept apart abroad makes it appear as if the British nation was spending a very large sum of money on national surveys, a much greater sum than other nations, yet at the same time, so far as the generally and popularly used maps are concerned, we have not got them.

853. (*Mr. Mather.*) Have you any knowledge of the revision which is carried on in France?—None whatever. I do not know anything about the process.

854. (*Chairman.*) Is it not the case that, as regards the large-scale maps of this country, much greater facilities are afforded to the public at the public expense than are afforded in foreign countries?—Yes; I quite agree with that.

855. (*Mr. Roby.*) Does it not almost come to this: that the public have been paying for the complete maps of England suitable for landowners and land purchasers' purposes?—Not only landowners. I should not only limit it to the owners. I do not think the landowners are the largest consumers of the cadastral map. A very much larger class of persons, I should say, is benefited by the cadastral survey than merely the landowners. I know it was looked upon in Parliament at one time as a landowner's dodge to get their estates surveyed for nothing. I think the profession that has the greatest benefit conferred upon it is that of the engineers.

856. (*Chairman.*) Engineers and land surveyors?—And land surveyors and for scientific purposes generally; mining engineers.

857. (*Mr. Roby.*) I am told the 6-inch map is what engineers use chiefly?—They use both. We also use town maps.

858. (*Mr. Mather.*) Here the municipalities have benefited very much by this map?—The local authorities, engineers, waterworks engineers, &c.

859. Do you know whether in Norway they would have to apply to a Government department for copies of certain things in order to get a map?—I am not aware that they have any cadastral map in Norway,

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they have what they call a county map, which is on the scale of about $\frac{1}{250,000}$ th, about $2\frac{1}{2}$ inches to the mile.

860. Are they published, as in ours?—They are published, but the publication is not completed.

861. And can be bought at any time?—Can be bought at any time. The great distinction is that the citizen in England pays through his Imperial taxation for this cadastral work, which in other countries the individuals would have to pay for either out of his own pocket or out of the pockets of his clients for whom he is doing work. If a civil engineer, a lawyer, or landowner wanted plans in any other country they would have to pay as much, if not more, than at home; certain individuals would have to pay the money. In our case the State gives a large subsidy in aid to produce the materials for the landowners, the municipalites, and professional men.

862. We see the total sum expended by the Ordnance Department every year, and in other countries it is diffused over a number of departments?—Quite so.

863. (*Chairman.*) Will you proceed now, Mr. Crook, with your comments on the Director-General's evidence?—Yes. The next point to which I should like to refer is that of the town surveys. I was very anxious to get at the mode in which the Ordnance Surveys laid down the limits to which they would extend the large-scale town plans, and I cannot say I understand quite what the rules are. I understand Sir Charles Wilson to say that the divisional officer reported, after consultation with the municipal authorities or with the local surveyor, what districts he thought should be surveyed at the charge of the State, and what districts, if surveyed at all, or rather if plotted at all, and published on the large scale, the 1/500, should be chargeable to the town itself.

864. I think the point is this: that all towns over 4,000 are entitled to be surveyed on this large scale?—Quite so.

865. As to the surrounding area of those towns which are to be surveyed, the district officer determines first of all what it should be, and secondly, how much of that surrounding district should be done at the expense of the town?—As to the latter it is left to the town to say whether it shall be done or not.

866. An agreed area is surveyed without cost to the locality, anything beyond the agreed area is paid for by the town?—If done at all.

867. If done at all?—It is very seldom done. That is the point, sir. The direction under which the survey is conducted—the order to the Director-General—is to survey all towns, as you have just stated, over 4,000 inhabitants upon this 1/500 scale. Then the Ordnance Survey—I do not know whether of its own instigation or not—says, "We will not survey all towns of 4,000 inhabitants, we shall only survey such portions of those towns as we think proper." It seems to me that they have not carried out the direction that they are charged with.

868. Who gives the direction?—The Treasury give the direction; in fact the Treasury seem to me to run the Survey.

869. The Treasury gives the directions, and the Director-General interprets them?—The direction is, "under existing instructions the under-mentioned maps and plans are being published: town plans on a scale of 126·72 inches to a mile (1/500) of all towns with more than 4,000 inhabitants." But what constitutes a town? One would naturally suppose that it would be the municipal area that would constitute the town. Because for most of the administrative purposes for which the plan is wanted, you want a plan of all the town, it is rendered very much less useful if you do not have the whole town.

870. Admitting that, do actual difficulties, to your knowledge, arise in the delimitation of this area?—Exactly, very great difficulties. I think it is one of the most important points in connexion with the town plans.

871. (*Chairman.*) Can you mention any town where you think the survey has not been adequately carried out from your point of view?—The town of Manchester. This is the index of the town plan of Manchester. I asked the town clerk before coming up to give me the area. The area of Manchester is about 12,788 acres.

872. (*Mr. Roby.*) How much of that acreage is contained in the portion recently added to the city?—Oh, a good portion of that has been recently added; but

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Mr.
H. T. Crook
C.E.

12 May 1892.

See Wilson,
p. 219.

See Wilson
p. 220.

Mr.
H. T. Crook,
C.E.

12 May 1892.

then that would not define the limits, because this map goes outside the limits of the municipal area in places; it has nothing to do with the municipal area; that seems to me to be curious.

873. (*Mr. Mather.*) You mean the municipal area is not the right term to use in connexion with the town; it ought to be the whole area under the jurisdiction of the town?—No word is used about the area of the town. It says a town of so many inhabitants.

874. (*Chairman.*) Now, Mr. Crook, many towns, in the popular acceptance of the word, extend beyond municipal boundaries?—They do; yes, sir.

875. And many towns have unpopulated areas within municipal boundaries?—Yes.

876. The direction which is given by the Treasury uses the word "towns" in an ambiguous form, so far in an ambiguous form that it gives to the office some discretion as to what they should survey?—Yes; I think I understand the way now in which that discretion is exercised. It is on the report of the divisional officer.

877. In exercising that discretion do you find that the Ordnance Survey Department deal with these towns in an unsatisfactory manner?—Well, I think considerable difficulties arise, because the position of an unsurveyed area, inside or outside any municipal boundary, makes a very great difference, especially in property, in streets, and the surveys for gas and water and drainage, and all those things which have to be done by the town. It is just on the very fringe of Manchester where the most extensive building operations are going on.

878. Are you a member of the corporation?—No, sir.

879. Have you been employed by them as an engineer?—No, sir.

880. Do you know that they have failed to come to an agreement?—I do know as a fact.

881. They wanted areas surveyed which have been refused to them?—Yes, except with regard to a limited portion of this unsurveyed area of the city of 6,188 acres. I believe, it is admitted that a considerable portion, 700*l.* worth of that area, the Survey authorities would be justified in charging to the public.

882. The city of Manchester is going to pay a sum of money for a portion of the survey?—Well, for these 6,000 acres not surveyed within the municipal boundary of Manchester, the Ordnance Survey want about 4,500*l.*, I think.

883. For a certain portion of the area within the municipal boundary the Ordnance Office require a payment of 3,000*l.*?—It requires a payment of 4,500*l.*. That is one of the points I want to bring out, because it seems to me that is a tremendous sum.

884. That 4,500*l.* for a little over 6,000 acres?—That 4,500*l.* for a little over 6,000 acres.

885. (*Mr. Mather.*) Is that the newly amalgamated portion?—Oh, the whole city of Manchester; that is the 12,788 acres.

886. But the 6,000 you spoke of just now costing 4,500*l.*?—That is a portion now within the municipal boundary of Manchester which is unsurveyed on the 1/500 scale. This is the index to the map, and these sheets have been published, and the Ordnance Survey say, "We have now finished your town plan of Manchester." The municipality thinks it is not a town plan of Manchester, as it contains only half of the city.

887. (*Chairman.*) The published map of Manchester does not contain the whole municipal area?—Quite so.

888. Does it contain any area outside that municipal boundary?—I do not think so, since the municipal boundary was extended. Yes, it contains some sheets on the south side, which are beyond the municipal boundary.

889. Can you give any idea of how many acres is included outside the municipal boundary area?—I do not think it is more than a few hundred acres—200 or 300 acres I should think; I am making a guess at it.

890. The area of which you complain as not mapped has not been recently taken in within the municipal boundaries?—Not all of it.

891. Out of the 6,700 acres which you have mentioned which is unsurveyed, and which is within the new municipal boundary, how much do you think has been added within the last two years?—I could not say, sir, without reference to the figures

892. Could you give us a rough idea?—No, I could not. I am not sufficiently acquainted with the areas that were taken in.

893. When was the map made?—This map was surveyed in 1887, I think.

894. (*Mr. Roby.*) Does it not come to this, Mr. Crook, that the Ordnance Survey interpret town to mean a closely inhabited district; whereas the corporation are desirous of the whole area within their municipal limits being surveyed upon the same scale?—They are, sir; that is the point; but it is not only in Manchester where the question is a little complicated by the recent extension of boundaries; but there are many other towns, my own native town Bolton, is exactly the same. There a large portion of municipal area is not shown on the new town plan.

895. And is that portion of Bolton thickly inhabited?—No, it is not very thickly inhabited, but it is being built upon constantly; it is where the great progress of the town is going on; it is on the fringe of great towns where these cadastral maps are most required.

896. Did the Ordnance Survey refuse to add to their survey?—They refuse to add to their survey in such cases unless the expense of so doing is defrayed by the corporations concerned.

897. (*Mr. Roby.*) Do you not think for these parts of the fringe which are not yet densely occupied that the 25-inch scale is sufficient?—I think not. I think it is much better to have the 1/500; this question is very much mixed up with the revision question which I propose to touch upon later; it is rather difficult to bring out this question of the areas of towns without going into the revision question and how one proposes to maintain these plans, because I certainly do not think the State should pay for all these town plans.

898. (*Chairman.*) You are inclined to think that the present rules as regards the survey of towns on the 1/500 is rather too liberal to the towns?—I think it is extremely liberal to the towns; but if Parliament has undertaken to survey the towns and ordered them to be surveyed, I think they ought to give the map where the map is most required, and it is in the surrounding districts that it is most required. For instance, in the neighbouring borough of Salford, I wanted some maps out here a little to the west which is thickly populated, more thickly populated than this which is shown, because it is the more thriving. They are laying out a lot of streets on the west, and the map is constantly wanted there, where there is no map. The 25-inch we shall not have for some time.

899. Salford is surveyed on the 1/500?—Yes, portions of it.

900. Does the map of Salford adjoin Manchester?—Yes. The charge proposed to complete the plan—the 1/500 plan of Manchester—is 4,500*l.* What I should like to get at is, how is that cost estimated, because you understand they are making a 25-inch map, it is only the difference between plotting the survey, and publishing it on the 1/500 and the 1/2500.

901. (*Chairman.*) You are a civil engineer?—Yes.

902. Is it not more costly to survey on a large scale than on a small scale?—No, sir; it is only a matter of a little extra detail in the case of such scales as these.

903-4. But the details on a large survey are greater than the details of a small survey?—Only when there is a very great difference in the scale; but there is not so much difference between the 25-inch and the 1/500.

905. (*Mr. Roby.*) I think the Director-General stated that the cost of the survey for the 1/500 would be 20 times as great as the cost of the 1/2,500 roughly speaking?—That might account for it. I had no idea there was such an enormous difference as that in the cost. In the case of this area of 6,000 acres, does the 4,500*l.* represent the difference between producing a 25-inch map and the 1/500 map? It is a question I am not able to answer, but it is one which has a great bearing on the subject.

906. (*Chairman.*) In Lord Bury's Committee it was stated that the cost of actually surveying a field for a 6-inch and a 25-inch map is the same?—Yes, sir, that is an important matter.

907. A very important matter?—A very important matter with regard to the cost to the nation. Whether it should be borne by Imperial or local taxation. It opens up a very large question, this matter of the town plans.

See Wilson,
p. 220.

See Wilson,
p. 220.

908. (*Mr. Roby.*) With regard to that is the 25-inch scale, supposing the map were published, large enough to enable you to lay out the new streets on it?—No, sir.

909. So that even for the purpose of a district at present unpopulated, but in process of being arranged for population you would require the larger scale than the 25-inch?—For all the purposes for which this 1/500 is useful it is most required in these districts where you are laying out a town.

910. And it was designed for that purpose?—It was designed for that purpose and for transfer of small parcels of property. The origin of this 1/500 scale is that the board of health said that the 5-foot scale was too small for sanitary purposes. It is really for municipal purposes that this map was designed, and the districts where the most important new works are going on—where the health of the inhabitants is concerned—are the districts where this large map, if wanted at all, is as much wanted as anywhere.

911. (*Mr. Mather.*) And your point is, not that the whole of the expense should be borne by the Department, but you cannot understand why so much is estimated for a small portion of a town being plotted out on this scale?—It is a large sum; it is 15s. an acre merely for the difference between one scale and another.

912. (*Chairman.*) Does Manchester object by its corporation?—I do not know. I am not here to speak for the corporation, but I am merely speaking as a private citizen of Manchester to show how it works unfairly. Enterprising towns have paid the Ordnance Survey Department for plans of their towns. Oldham paid for a town plan—well, Oldham has contributed to the survey a considerable sum of money. Now of course it must be much less cost to the Survey to re-survey Oldham on their second visit, when they have plans of comparatively modern date in existence. The same holds good of Stockport. St. Helens and Bury also made contributions to the Ordnance Survey for surveys of their towns, and in the Eccles parish, in which I lived for a number of years, we paid for the 25-inch map in advance 15 years ago. Well, the Ordnance Survey benefits by that, and we have paid in Eccles a contribution to the Ordnance Survey which has not been exacted from other parts of the country. Of course we had our maps in advance, but it has cost the Ordnance Survey less to amend our map than in the neighbouring parish.

913. You had the advantage of a recent revision?—If local contribution is to come into the question at all, it ought to be systematised instead of being left to the casual operation of peculiar circumstances. Conditions differ so much. No one would suggest surveying the whole area of the new borough Rawtenstall, which includes much high moorland, many acres which will never be built on and which it is no use surveying on the 1/500.

914. (*Mr. Roby.*) Do you think that it ought to be borne in mind that the productions of these large plans on the large scale is certain to delay very considerably the plan of the survey of the 25-inch?—Yes, that should never be lost sight of, certainly. This is an important matter. I suppose there is a delay. Of course the 1/500 all comes in for the 25-inch; it is all reduced to the 25-inch afterwards.

915. (*Chairman.*) It is never published in the 25-inch, is it?—Oh, yes; Manchester will be published on the 25-inch; it has not been published yet, but it will be.

916. (*Mr. Mather.*) Are you prepared to suggest, Mr. Crook, that every municipality should pay the department for the survey of its area on this large scale?—Well, sir, when we come to the question of the revision, I have a scheme which I am anxious to lay before the Committee and by which I think the municipalities and private individuals also who want these large-scale plans would really contribute to the survey and would probably pay the entire cost of the revision when once the survey is completed.

917. (*Chairman.*) To your knowledge, Mr. Crook, do the towns keep up these large maps themselves?—No, sir; as a rule they do not.

918. I mean by keeping them up, correct them?—No; well in many large towns it is done, but the majority of towns keep them up very badly indeed, and the work done is not to be relied upon at all, and is not available to the public.

919. (*Mr. Mather.*) I understand the town of St. Helens in Lancashire has been very well kept up by the local engineer?—So is Liverpool; I am told they have a special staff for keeping up their town plan, it is not so well done in Manchester; there is no special staff.

920. (*Chairman.*) You heard my suggestion about surveyors of towns and their surveyors being obliged by Act of Parliament to forward copies of alterations of which they have official knowledge in the shape of tracings to Southampton?—Yes, I did.

921. And you heard the objection of Sir Charles Wilson to adopting this?—Yes.

922. You think they would be untrustworthy from what you have said?—I do. I do not think the scheme is practicable at all, because the quality of the work done entirely depends on the individual who for the time occupies the position of surveyor to the authority.

923. And the average surveyor is not competent or not sufficiently competent to be trusted to send a correct map?—You would never know whether he was competent or not, and the Survey authorities would never be able to find that out unless they went down and tested the work; one surveyor leaves and is followed by another; the Survey would have to send down to test the work every time that there was a change.

924. (*Mr. Mather.*) If the department were to sanction the appointment of a surveyor in the town itself for such purposes, then you would rely upon his work?—Then you would practically be establishing a revision department, but what the Chairman was asking me was whether it was advisable to make it compulsory by Act of Parliament for surveyors to send notices of alterations, and not notices of alterations only, but to send tracings of the alterations on the Ordnance map. I take it that is what you mean.

925. (*Mr. Mather.*) That is revision?

926. (*Chairman.*) But it is local revision?—The Chairman intended to utilise the vast number of surveyors up and down the country, every year obliging them to forward their alterations to the Ordnance Office to be put on the maps at Southampton. I do not think it would work, and I do not think it would be trustworthy. The Ordnance maps would soon get into disrepute if that system were adopted.

927-8. (*Mr. Mather.*) You have a scheme to meet that which you will lay before us later on?—Yes; the question of revision, I think, is most important; perhaps it would be as well that I took that now. It is essential, that in all these towns where we have got the new maps like Manchester, for the keeping up of the maps, that alterations should be recorded as they take place. Every time these plans on these exceedingly large scales are used, they want a certain amount of correction. Of course corrections would be done under present circumstances by the surveyor employed by the person wanting those corrections. Public works like a new railway or a great clearing for the widening of a street like Deans Gate in Manchester, which was demolished from one end to another, large operations of that sort render many sheets of the map quite useless. A revision department ought to be established, and ought to have a proper grant given to it. The staff should be located in various convenient centres, say Manchester for Lancashire and 20 or 30 miles round, Leeds for the Yorkshire district, Bristol for the south-west of England; stations of that kind, convenient to the population. Each district should have nothing to do with any other district. You will notice in the Director-General's report that there is an almost comical distribution of the staff at the present moment. I think that the re-survey of Manchester is being conducted from Bedford.

929. Derby?—South-east Lancashire and north-east London are stated to be under Captain Buckland at Bedford. I ask that the places to be chosen should be central to the large centres, the population should be grouped, and the staff of the district should be a permanent staff; the south-east Lancashire staff, the Yorkshire staff, the south-western counties staff, and the south-eastern counties staff.

930. So far, you are agreed with the Director-General except as to location?—Except as to location, they should be in the centres of the large populations. He said he thought it better for the men to be in some country district.

Mr.
H. T. Crook,
C.E.

12 May 1892.

See Wilson,
p. 220.

See Wilson,
p. 220.

Mr.
H. T. Crook,
C.E.
12 May 1892.

931. That is a question of administration; the principle in the same?—I do not think quite so, because the great amount of correction will be in the larger centres like Manchester. Salford, Bolton, Bury, Oldham, &c., are all within a few miles of Manchester. The great bulk of the work will be going on there. If you have a station located 30, 40, or 50 miles away, the people who are doing the work have to live in Manchester. The south-west of Lancashire is now being done from Chester.

932. Surely that means that the district office is at that particular place?—Yes.

933. Your argument would go to this extent, the office at Southampton ought to be at London, and not in Southampton?—Where the maps are made, when the work is done, that is a different thing altogether.

934. That is what is meant?—No, not in revision.

935. Captain Buckland who lives at Bedford has got to do Manchester; the office and the drawing arrangements, everything connected with the office work would be at Bedford; but naturally he and his surveyors would necessarily live at Manchester when they were surveying in Manchester?—The surveyors must do; therefore I cannot see the force of Sir Charles Wilson's objection; he liked to keep them away from the great centres of population because it was better for the men.

936. It was the question of discipline and arrangement?—As to Southampton, that does not affect Southampton at all, and its photographic processes and engraving.

937. On a lesser scale it would apply equally to Bedford and Manchester?—Not for revision if worked out in the way I suggest. I said this, great changes are in progress in those prosperous districts, and people very often want a large survey made on the Ordnance map. Until we had the new map the old 5-foot map was 40 or 50 years behind time, and required so much alteration to make it useful for any public purposes, like the re-arrangement of a street, or the construction of a new railway, or the works of the Ship Canal, the docks, for instance, that it was just as easy to re-survey; in fact that is what was often done. In the same way, in the purchase and sale of land, the transfer of land, the plots were not recognisable on the old map, the condition of things had so changed. When maps are wanted for these purposes, if you had a local revision department there which was entrusted with the revision of each district within the 15 years' limit laid down by the Treasury, and recommended by different Directors-General as a suitable period, then anyone wanting a corrected plan at an interval between that time, would get it done by paying the fees to this office—to the divisional revision office.

938. That each district should be autonomous as regards its revision?—Well, not quite autonomous; the revision should go on over 15 years. You were asking just now about keeping up the town plans; that is a source of great expense to the towns, especially where it is properly done; but nobody could keep it up better than this revision staff, and the public would be assured that the work was correctly done, and done by an independent responsible authority not influenced by anybody—by the corporation or any individual—and the map would be perfectly secure. For all land transactions and things of that sort you must have a map that is beyond suspicion. The staff would have the revision to do every 15 years, and they would be able to do any special plan that was required much more cheaply and quickly than an individual surveyor; by that means they would be paid for a large portion of the revision work. Supposing I wanted a copy of the Manchester Ship Canal Dock, which is not on the new plan as the work was in progress; there will be an immense amount of building of warehouses around there. Supposing I wanted a plan of the new district with the new streets laid out, I could go to the divisional revision office of the Survey, and say I want a plan up to date of the Manchester Ship Canal Docks and neighbourhood showing the streets, they would then set to work, and correct a plan in manuscript, and give me a plan corrected up to date; they would then have at their office for future reference the particulars of the alterations up to that date. I should pay for the work either for myself or for my clients, and it could be done much more cheaply than I could do it myself.

939. Well, now let me ask you this: first of all are the docks within the municipal area of Manchester?—Partly in that of Manchester and partly Salford.

940. They are within the area mapped on these 1/500 scales?—No, only a portion of it, not all of it; a large portion of the new docks where all this work will be going on very shortly, and a most important centre in Manchester, is cut out of the map.

941. And they are not published on the 25-inch?—No, not yet.

942. Supposing they were published on the 1/2500 (25-inch) or the 1/500 (10 feet), the town clerk of Manchester would necessarily have plans. Under the bye-laws of the city all proposed buildings and docks will have to be shown, if he chose to require it, on the town scale; he would in fact be in possession of a perfect map?—He could not ensure it being on the town scale.

943. By the bye-laws he may?—You will have to alter the bye-laws for that purpose.

944. Yes, if the bye-laws do not already make it necessary, it would be advisable that they should be altered; it would be a very reasonable requirement in every town; plans are required to be deposited in such form as the local authority chooses to direct, practically that is the bye-law where they have an adequate map. There is no reason why they should not make that form the Government map?—But it could not form a correction of the Government map.

945. It could always be done on the Government map?—It could always be done on the Government map.

946. You have got an area properly plotted on that in a different colour; you can show any new work that you want?—Yes, sir.

947. That in itself is a complete revision when it is carried out, if you could depend upon those lines correctly indicating what is going to be done or has been done?—Yes, but very seldom the plan which is deposited is carried out exactly, and then it would be done by different people, submitted by different surveyors, and the work would vary very much in value. I do not see any possible way of doing it, except in the way I have indicated, at least if it is to be thoroughly reliable.

948. In every case, then, you consider that a new survey must take place of every alteration of a town plan?—Yes, sir.

949. By the Ordnance Office?—By the Ordnance Office, yes.

950. And that the plans deposited with the town surveyors would be inadequate for the purpose of that revision?—I think so.

951. (Mr. Roby.) Unless the town required that the plans deposited should be made or certified by the Ordnance authorities?—That would come to the same thing; the Ordnance authority would have to check it. The Ordnance Survey would not trust it; if they had to certify, as Mr. Roby suggests, they would have to go and examine it before giving a certificate.

952. I suppose the Ordnance Survey would be assisted in the revision if they could go and test authorised plans rather than make new plans themselves?—I do not think they would, sir. I think the municipality would benefit very much if, instead of doing any revision in the city surveyor's office, they would pay what would have been the costs of the revision and hand it over to the Revision Department of the Ordnance Survey; that would be my plan of overcoming the difficulty. I would say, if you are a properly administered township or town, you ought to keep up the town plan in accordance with the Public Health Act. The Public Health Act does not compel it, it only advises it. Every building, every house should be shown upon a perfect town plan up to a certain date. I think the towns spend a good deal of money when new streets are laid out; all alterations made in buildings must be put on the town plan. If they would entrust the revision department with that and pay them so much per annum to keep the sheets revised, a large contribution would come from these towns to the Ordnance Survey. No one would be a penny affected, because this money is now spent, but is spent on work which is only available for the municipality.

953. (Chairman.) The town at their own cost, then, should pay the Ordnance Department for keeping their plans up to date?—Yes, sir, that is it.

954. (Mr. Roby.) Would you not anticipate under that plan a great number of alterations sent to the Ordnance Survey of the district all marked "Urgent"?

—It depends upon the amount charged; if you have too much "urgent" you would have to make a special charge for making a special survey. The matter would regulate itself. Under ordinary circumstances the Survey Revision Department could supply a corrected map at a lower price than any private surveyor. If there was a large and sudden demand, as might happen before the Parliamentary session, then those wanting plans would have to pay an extra price, or go to private firms, as they do now.

955. The Revision Department would contain a lot of rural property, and from that part of the area you would only get very few applications for repeated alterations or revisions, but you would get a great number from the town itself?—Yes, sir, that is what I mean.

956. So that it would not be a very difficult matter to keep up with all the urgency used in connexion with town alterations?—I think not.

957. (Mr. Brickdale.) Would local surveyors agree to a scheme of that kind?—I should anticipate considerable opposition at first from backward towns; but I think it is a question about which Parliament and the State has a right to say, "It is your work, it is municipal work." If we could only get them to see it in that light; they are already spending the money. I do not propose to put any fresh tax on the town, for the average expenditure of municipalities on correcting town plans would be more than adequate for the work of the Revision Department of the Ordnance Survey.

958. (Mr. Roby.) Would you make it compulsory on the towns to do it?—It is no use unless it is made compulsory.

959. So that the Ordnance Survey should be bound to supply it if the town made application?—No, I should make it compulsory that they should pay a calculated portion of the cost of surveying their town.

960. (Mr. Mather.) At present it is compulsory on the Ordnance Survey to do it; but it does not do it, you say?—No.

961. It has done it slowly?—No, it has not.

962. It has done Manchester?—Revised it? The revision has not commenced yet; that is why I am rather anxious about this point; that the Committee should thrash it out and ascertain the feelings of the public upon it and the practicability of it. The revision has not commenced, and some portions of the survey are now four years old.

963. (Mr. Brickdale.) Do you think it would be possible for the Ordnance Survey to empower local surveyors whose skill they had tested to supply them with work?—I think that might be done; that is only a matter of utilising the civil surveyor if he is up to the standard of the Department. Most of the surveyors are civilians; it is only the direction of the Survey which is military.

964. That might get rid of the local opposition to a scheme of that kind, would it not?—Yes, I think it would lessen it, certainly.

965. (Mr. Roby.) Why do you say that it is necessary to be compulsory and not optional to the towns to get this done by the Survey if they require it?—Because the Treasury have laid it down and all the Directors-General have laid it down that it is absolutely necessary to have a revision every 15 years at least. We want to get that scheme into operation. A commencement has not been made yet, and we ought to commence it on the right lines. If you made it optional, lazy towns would not contribute; they might be spending just as much money as if they had contributed, in keeping up the town plan in the ordinary way when it is not available for the ordinary citizen, as if they had handed it over to the Revision Department. If the sale was large the Revision Department need not wait for the 15 years to expire, but publish fresh sheets; there would be more sale for the plan—the fresher the plan the larger the scale.

966. The Ordnance Survey, when once arrears have been made up, will complete the revision every 15 years?—They say so.

967. And I understand your proposition to mean that in the case of large towns the expense of revision would be, to a great extent, defrayed by the town paying the Ordnance Survey the money which they now spend imperfectly on a similar process?—That is my point, quite. I do not contemplate forcing on the town, or

even country sanitary authorities, an expenditure which is not now incurred. All I want to do is to get this money which is spent on imperfect revision—just as in the old days it was spent on imperfect surveys for various authorities, such as the Tithe Commissioners and the Enclosure Commissioners—money was spent by them on plans which were no use to anybody else, and the same thing is going on now. There is a large expenditure going on throughout every populous district in making and revising plans, and if the towns would pay a sum equal to what they are spending in patching up their town plans into the hands of the Revision Department, the cost of the work to the State would then be practically nothing, and nobody would be one penny the worse.

968. Do you know as matter of fact any similar towns in a less progressive part of the country than the manufacturing districts of Lancashire and Yorkshire, that there is a similar expenditure always going on for revision purposes?—No, there is not; but there ought to be.

969. (Chairman.) My little district paid an extra sum to a surveyor to bring the 1/500-scale plan up to date.

970. (Mr. Mather.) Do you not consider that the resident surveyor or the borough engineer of a town would constitute a competent authority to conduct this work for the Ordnance Survey?—No, sir, I would not like to have it under any municipal authority or control at all. I think, first of all, surveys which are made for national purposes, for the use of everybody, should be made by a perfectly independent authority and outside the control of the town.

971. I thought you said a local surveyor might be certified as competent?—A local surveyor might be certified as competent, but so far as his work was concerned he would be subject to the Revision Department.

972. (Chairman.) He is not to be the town surveyor in that case?—I do not see how a surveyor in a large city like Manchester could serve two masters in that way. I understood Mr. Mather to mean competent local surveyors, private surveyors, not the servants of local authorities.

973. (Mr. Mather.) In connexion with this Revision Department the officer would have a good deal of work besides that of merely keeping up the revision of the town or the villages in his district; he would have to supervise the entire revision of his district?—He would have to revise his district.

974. And the officer of the Department would have his location in a populous place?—In a populous place, and he would be responsible in his district for the revision, according to the Treasury idea, in 15 years; that is, he is to cover his whole district in 15 years, whether revision is asked for by anybody or not.

975. And the district will probably be marked out, of which he is to complete the revision within 15 years?—Yes.

976. But in the meantime if the local authorities desired to have certain special maps produced of their own areas this Department could supply these maps and be paid for them?—Could supply them; and they could supply them more cheaply than the city authority could conduct a survey themselves.

977. (Mr. Brickdale.) A great landowner might break up a large estate and lay it out in roadways for building purposes; there is no reason why he should not get his plans from the Revision Department, get them to set out his estate?—Quite so.

978. It would be an authority in the highest sense of the word to have such a department to apply to. He would say to them, I am laying out this property; I want a plan of it now. They could supply it more cheaply than anybody else?—Yes.

979. That would be a less expensive plan, would it not, in dealing with the whole country than having a central staff here in London?—I think it is essential for economical revision; that the revision should be done locally. That the country should be divided up into revision centres, and that the staff would be permanent in each district. You have another advantage if you localise revision under permanent officers in charge of the Revision Department; they would be in touch with the scientific societies, archaeological, geological, and others; all those people who take interest in such things locally. The divisional officer would become intimate with

Mr.
H. T. Crook,
C.E.
—
12 May 1892.

See Wilson,
p. 220.

Mr.
H. T. Crook,
C.E.
12 May 1892.

those people, and would not make mistakes with regard to places, names, and things of that kind. The same thing takes place in Lancashire which is complained of in Scotland and Wales. The Ordnance Survey of Lancashire is covered with mistakes. Boggart's Hole Clough in Lancashire, for example—everybody knows what a "Boggart" is, it ought to be "Boggart."

980. (*Chairman.*) What is a Boggart?—It is a hogey.

981. We had evidence from the Director-General that all names put on the maps are certified by three persons as correct?—I did not understand the Director-General clearly as to whether that applies to the cadastral survey and the new 1-inch Ordnance map, or whether it applied also to the old ones. I do not think it can possibly apply to the old ones.

See Wilson,
p. 220.

982. That is their present practice for the new map?—That is where misunderstanding arises so often; the Director-General in answering criticism—various Directors-General in answering criticism state things which the Ordnance Survey is now doing, and possibly the critic is objecting to something which exists, and which was produced by a Director-General 40 or 50 years ago. For instance, take the case which I illustrated in the "Times" letter the other day about this place named the Peak. I do not know why the Kinder Scout is called the Peak.

See Wilson,
p. 220.

983. We will go into that matter presently. I understand the Ordnance Survey are prepared to defend the use of the word "Peak." We will take that matter separately. Can you suggest any better way for securing the correctness of names than that which the Director-General states is the present practice?—By this proposed local revision. If the gentleman in charge of the revision, whoever he may be, the superintendent of the local revision department, and the Revision Department, its officers and men, are permanently attached to definite districts, they will very soon be in touch with everything in the locality, with the people, antiquarians, and the scientific and other local societies, whoever they are. They will know all the chief men and all the authorities in the district on the local antiquities and on the names of places.

984. That would entail a very much more subdivided distribution of the force?—Well, I do not think so, sir; not very large; it depends upon, of course, the rank of the superintendents of the division.

985. Now, for instance, my headquarters are down at Clifton, but that is about 35 miles away. The officers there could not be conversant, in the sense in which you use the word, with local names about my neighbourhood?—I think they very soon would be. They would be in touch with the local societies at Bristol and Bath. At Bristol and Bath, for instance, there are several societies; they would know all about their neighbourhood and locality. It strikes me that a man who resides in a place for a number of years, very soon knows his way about and knows men who would be likely to give reliable information with regard to local matters and local residents, both scientific and otherwise, and in going over the district of which he was in charge he would come in contact with all the different people.

986. (*Mr. Mather.*) Would you divide it by counties?—No, I think not, sir, because I think the divisions should be selected as groups round some centre of importance. Strike a radius from Manchester of 20 miles, you get an enormous population; probably the Manchester district would be very small.

987. You would make Liverpool another centre, in the case of two large places being so near?—Well, I do not know, it would depend upon the total number of sub-divisions. That is going into details, and I could not give all the details, because we have not had the experience.

988. (*Chairman.*) So far as I know a great deal of pains was taken about the names. On two occasions an officer, or rather one of the non-commissioned officers came to me and showed the maps and asked me to look over the names with him. I made sundry corrections; he might have quoted me as one of his authorities for all I know, we cannot correct the old 1-inch maps now?—No, the misapprehension is that that has been done for all maps issued by the Ordnance Survey, whereas this scheme asking for these three authorities must be comparatively recent.

989. (*Mr. Brickdale.*) With regard to this scheme of revision generally, though in various ways it seems an

exceedingly good one, yet you cannot lose sight of this, that it would take a large quantity of work which at present finds its way to the town surveyors in the employment of the municipalities out of their hands. Supposing the work of revision was undertaken by the Ordnance Survey, would not that give rise to opposition?—Town surveyors are not as a rule allowed to take private work; as regards other surveyors that has already taken place; that was done when it was decided to adopt the cadastral survey. Except in Lancashire and Yorkshire, where they have not a large scale map, surveying has been knocked on the head, surveying is going out now-a-days in the engineering profession, it is quite a remarkable thing to find a man who can survey.

990. (*Mr. Mather.*) I think perhaps you have given too much importance to the statement that certain maps have been prepared for the municipal authorities by the borough surveyors. Very few have been prepared at all, and those only of the roughest description for some particular purpose, laying down a road, or making a main sewer. I do not think there is any systematic attempt, except in Liverpool and St. Helen's, where the local surveyor has attempted to keep up the municipal area with anything like the exactitude that the Ordnance Survey require. There is no vested interest touched or could be touched by such a scheme as Mr. Crook suggests?—No, we civil engineers in the old days when large works were projected had the entire survey to make. In North Wales, at Llandudno, I made a survey of 14 miles of country between Llandudno and Llyn Dilyn for the waterworks. There were no Ordnance maps of sufficiently large scale. Mr. Latham was my employer at the time, and it provided so many months' work for me and a staff, of which I was in charge. That is a work for which he was paid, and employed a dozen of us younger men. All that work has gone from the engineer, and he does not get his commission on it now. It is only carrying on to its conclusion what has already been begun.

991. That means in the country, I presume?—Yes; most of the land agents send for a surveyor whenever they want any surveying done. They inquire for a man who is a competent surveyor to do it.

992. (*Chairman.*) They have no one in their own office; they get somebody who surveys?—They get a man who makes a profession of surveying, who makes surveying his business.

993. Will you go on to another head?—There was a point while we were on those large-scale maps of the mode in which they are produced—the colouring. I think you will find a great number of complaints about the coarseness of the new maps; I do not attach any importance to that myself. Many people objected to the new town plan in Manchester, and stated how abominably the Ordnance Survey was falling off in the style of its productions. I suppose the coarseness is a necessity of the process, and also because the map is to be reduced to the 25-inch after. The new plan at first sight looks a very coarse thing compared with the old copper-plate 5-foot town plan. I see no force in the objection; it is good enough for anyone. I do not see why the country should be put to the cost of engraving when they can produce so good a map as that. Of course the lines are rather thicker than is necessary. I only wish to draw the attention of the Committee to a complaint which is made, but which I do not think is very important. You will hear complaints against the re-survey that I do not think are justifiable very often. Because they produced such beautiful copper-plate engravings before, and these are contrasted with them, thus people get the idea that the Survey is falling off in the quality of its work and that it also means incorrectness.

994. Is it useful on the surveys of buildings to make a thick line on one side and a thin line on the other?—It is necessary in maps like those of Liverpool when sold uncoloured; there would be no means of showing which were buildings and which were not buildings without the thicker line.

995. (*Mr. Roby.*) If the building is denoted there by hatching or colour then the shadow line is unnecessary?—Is unnecessary, except for artistic effect; it gives a little more finish to the plan.

996. (*Chairman.*) You do not object to that?—I do not object at all. The fact now is that maps are published coloured and uncoloured. Years ago the uncoloured were difficult to get without considerable

delay, they have still to be specially ordered; therefore many people are under the impression that these town plans are very costly.

997. The coloured plans are costly?—They are costly. I understand this has a material effect on the sales. Manchester and Leeds plans which are cross-hatched are having a good sale in comparison with Liverpool and other towns which are coloured.

998. If that map were painted, and not the cross lines, what would that map be?—About 8s. 6d.

999. (Mr. Mather.) Cannot it be obtained coloured now?—No; and I say the Department should stick to one thing. What is wanted with regard to maps is uniformity; have them in the same style; treat everybody in the same way.

1000. (Chairman.) How would you prefer maps to be published?—In the Manchester form I think, because as Sir Charles Wilson said putting on red interferes with the utility of the map. Any colour will show perfectly well on this cross-line form, and it at once defines what are buildings without any trouble. An experienced man might go wrong in defining buildings given in outline only.

1001. The sale price of the cross-line map and of the plain map is the same, but if the plain map is coloured it raises the price very materially?—It depends upon the amount of colouring. There are maps published by the Ordnance Survey which cost 23s. a sheet.

1002. (Mr. Roby.) You do not exclude the possibility of there being two or three different types used for all the Kingdom?—Yes, I do, for they are not required. Let us assume I had a commission to do certain work at a certain town, and that it is essential for me to get some town plans, I telegraph to the agent for them if I want them next morning, and usually these things are wanted in a hurry, I find myself landed in a big bill for perhaps 8 or 10 large coloured town plans sent down. My own town I know is 2s. 6d. per sheet each, so you see if I wanted eight plans of Manchester I could get them for 1l., but if I wanted these for another borough not any further off than Liverpool, and I was not acquainted with Liverpool and I had some professional work there and I sent for some plans of an equal area in Liverpool, I should have to pay five or six times the price.

The witness withdrew.

Adjourned till Wednesday next, May 18th, 1892, at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

FOURTH DAY.

Wednesday, 18th May 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

SIR ARCHIBALD GRIKIE, F.R.S., F.G.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON, R.E., Secretary.

Mr. HENRY TIPPING CROOK recalled and examined.

1013. (Chairman.) We had just finished the town plans, had we not?—I think we had, sir.

1014. We were just coming to the 25-inch when we left off?—Before we proceed, sir, I should like to say, in reference to local surveyors and revision, that I am very anxious not to let it go forth that I made any imputation about their workmanship or their way of carrying out surveys; but what I wanted to point out to the Committee was the importance of having a map of authority throughout the country, and not to rely on the surveyors whose work might vary in value. In

1003. (Mr. Mather.) Why?—Because they are coloured. But if I wait and send a special request through the agent to Southampton, the uncoloured maps will be sent down.

1004. Would you not deal with these plans as the French do with their plans, have them in different types, so that you could get a coloured plan or a cross-lined plan, if you wanted it, or simply an outline plan?—There is a great difficulty in that: you heard the Director-General state the number of these town plans and the 25-inch survey. If you have these large-scale maps in several forms you then have a tremendous quantity of storage; you have a number coloured, uncoloured, cross-hatched, &c., and that makes such a tremendous difference.

1005. You suggest one distinct map?—The same all over the country.

1006. Cross-lined?—Cross-lined; the same all over the country; the same as that Manchester one.

1007. Not coloured?—Not coloured.

1008. Do you not think this cross-lining is rather too heavy?—It is a little heavy.

1009. Frequently within these spaces cross-lined on a map of this scale one would like to put some memorandum—notes, black cross-lining seems to prevent it being used for notes?—Yes, it is heavier than the others.

1010. (Chairman.) Do you know whether Stanford keeps both coloured and uncoloured?—I know he does not because of the multiplication of stock; he always has to send to Southampton for uncoloured plans. I do not say he has no uncoloured plans in the shop at all, but as a general rule of any particular town he does not keep the uncoloured plans.

1011. (Mr. Roby.) Does he keep those with hatching?—That is the only one of Manchester, we have no coloured plan. I cannot see the reason for producing two or three different forms. I believe there is one town in Yorkshire which is half coloured and half cross-hatched.

1012. (Chairman.) You say all town plans should be cross-hatched in black?—Yes; I should like them in red but I quite see that in that case they would be open to the objection of Sir Charles Wilson that if they are red you lose another colour in which you might want to add something.

Mr.
H. T. Crook,
C.E.

12 May 1892.

Sir Wilson,
p. 220.

Mr.
H. T. Crook,
C.E.

18 May 1892.

Mr.

H. T. Crook,
C.E.

18 May 1892.

which the charge for these extensions beyond the area recommended by the divisional officer, whether outside the municipal boundaries or inside the municipal boundaries, is calculated, that is, how the Ordnance Survey estimates the value; because I have had a good deal of correspondence recently since I took an active part in this matter of the reform of the maps of the Survey. Only the other day the borough engineer of Bury told me exactly the same difficulty arose in Bury; only about half the municipal area was surveyed on the $\frac{1}{2500}$ scale. They have paid or are paying to have the survey extended to the full limits of the borough, because he thought the land would be immediately built upon. He takes the same view as I do, that where the plan is wanted most is in those progressive districts on the outer fringe of the extending town where property is changing hands very frequently.

1016. Does he complain of too high a price?—Of the price, no. I may tell you the price at Bury is 10s. per acre.

1017. (Mr. Roby.) That is to survey the unsurveyed portion of the town on the large scale?—On the large scale which Manchester is anxious to have done; but they propose to charge Manchester 15s. per acre.

1018. (Mr. Mather.) In connexion with the statement just made by Mr. Crook, may I refer to a communication made to myself in relation to the local survey of the town of St. Helens by the borough engineer. It bears somewhat on the point just raised by Mr. Crook. This borough engineer showed me upon the Ordnance map the enlargement of the borough and all the parts very carefully laid down, which brought the town practically up to date within its limits on the large scale, and he offered it on behalf of the corporation gratis to the Survey. They at once refused, whilst for some tracings made by them of the survey work not yet published they charged seven guineas payable in advance. One would have thought that after checking they would have adopted work done by a man for years borough engineer. This somewhat bears upon the point you have raised about the local surveyors being capable of doing the work. Do you suppose the Ordnance Survey would be justified in refusing a survey made carefully by any competent borough surveyor of his own particular town?—Well, my point is this; I think, sir, that surveying is rapidly going out as a profession in consequence of the Ordnance maps on large scales having been made; and although I have no doubt the borough engineer of St. Helens is an exceedingly capable man and his work is perfectly accurate and trustworthy, how are the Ordnance Survey authorities to accept the surveys made by an individual of whom they have no guarantee as to his professional capacity. If the scheme for revision which I have been advocating before this Committee is adopted, the Ordnance Survey would do this work which this gentleman at St. Helens has done for the town. It ought to be done every few years almost automatically, if the suggestions I have made before the Committee were carried out. Thus the work which the St. Helens people have no doubt spent much money upon would have been done by the Ordnance Survey. It might probably have cost less money than if done by their own engineer, and with this advantage, that the maps produced would have been published and available for the general public.

1019. Do you say a survey made by a borough engineer of any town would not be trustworthy unless checked by the office of the Ordnance Survey?—I think it ought to be checked to see whether it is in accordance with the Ordnance Survey system, whether buildings and streets are shown in accordance with the Ordnance Survey rules, for you must have one uniform system.

1020. That was done in this case practically; an Ordnance map of the town was completed by the borough surveyor, but was declined by the Department, I presume because it was not conducted by one of their officers?—Because it had been conducted by a gentleman not responsible to the Ordnance Survey for the work; if any error is found you could not blame the Ordnance Survey. They would at once say, "We were told this gentleman was a competent man; we accepted his survey, and if there is anything wrong with it we are not responsible."

1021. (Chairman.) Do we understand that the borough surveyor of Saint Helens took the Ordnance Survey, such as it was, and added to it to correct it up to date?

1022. (Mr. Mather.) Yes, that is it, and submitted the corrected plans to the Department and vouched for

their absolute accuracy, the borough engineer being a very competent man. They declined to have anything to do with it; it was on the 126-inch scale. Do you hold, Mr. Crook, that the Department cannot in the future make any use of the local knowledge and abilities of a borough surveyor in any such case, for instance, as that of St. Helens, but they must everywhere place an officer of their own to conduct such changes in the local maps?—I think they must, for this reason, that in various boroughs some members of the corporation, at all events, might have a very economical fit, and they would say: "We do not see why the amount of money which is required for a very accurate survey should be voted." They might try to scamp it to save the rates of the town and say: "We will only allow so much." Say the borough surveyor wants 400l. or 500l. annually for work of this kind, and the corporation say: "We will only vote 200l. annually," what becomes of the work. It will not be so well done; it will only be skeleton work in comparison with the rest town done on the Ordnance Survey lines and rules; thus one town would have an inferior map.

1023. Do you not think that the local authority of the Ordnance Survey might make arrangements that would insure absolute accuracy and they would get the benefit of local knowledge in connexion with the work done?—The borough surveyor might do it if it were supervised.

1024. (Mr. Roby.) "Examined"?—If the official examiners went over it you might employ the borough surveyor as the surveyor.

1025. (Mr. Mather.) It seems to me that this special case of St. Helens suggests what might be done all over the country, supposing the Ordnance Survey Department made arrangements with the local authorities.

1026. (Chairman.) What do you say as to the price of 10s. and 15s.?—I want to know how it is arrived at; I am not able to say how it is arrived at, but I think it is a piece of information we should have; the cost of the difference between the two surveys, the survey on the 25-inch scale and that on the $\frac{1}{2500}$ scale, the 126 inches. The difference to Bury between the two seems to be only 10s. an acre and in Manchester 15s., and I should like to know whether that 10s. and 15s. in either case truly represents the actual cost of plotting the work with the extra detail of the $\frac{1}{2500}$ over the cost to the nation of making the $\frac{1}{2500}$.

1027. Can you give us any idea of what the value of a survey is, beginning from the commencement, for a drawn plan. I am not speaking of printing and publication?—It is very difficult indeed to estimate; I do not know, I am sure, what it would be.

1028. (Sir A. Gellie.) Could Mr. Crook give us any information as to the difference of cost at St. Helens which has been referred to; what would be the difference of cost in having the work done by a borough surveyor, afterwards having it gone over and approved by the examiner of the Ordnance Survey and having it done from the beginning by the Ordnance Survey?—I think on the whole the cost would be much greater if the St. Helens method, the method which Mr. Mather has brought before this Committee, were adopted, of utilizing the surveyors. You would have to have in every town of any size at all a competent staff to do this work; you would not only have to have borough engineers and local surveyors to be actual surveyors—many of them are not—many surveyors in small places are called the borough surveyors, whose duties never take them out into the field as surveyors at all, except perhaps for a few trifling measurements. I mean it would be quite impossible for many surveyors of local authorities to do this work. In the larger towns undoubtedly you would have more competent men; more highly-trained men; very likely they would be able to do it. Those in large towns occasionally are men who are not surveyors, as there are in the engineering profession generally now a good many engineers who would not know how to make a survey. No doubt they very soon could be taught. This competent staff in every town would seem to be a more costly operation than the Ordnance Survey doing work, because their staff would not necessarily be occupied at Manchester, Liverpool, Saint Helens, or Bury all the year round, they would be occupied according to my idea of the revision scheme in revising the whole of the district which was allotted to them within the 15-year period.

See Wilson,
p. 220.See Wilson,
p. 220.

1029. (*Chairman.*) I suppose the town plan ought to be kept up every 12 months?—It ought to be continuously corrected.

1030. (*Mr. Roby.*) The town plan ought to be kept up by the town authorities in connexion with the Survey, giving the information to them as to where alterations were taking place?—Certainly.

1031. (*Chairman.*) Would it be possible for the Ordnance Survey Department to correct every town plan within 12 months?—I think all the larger and more important alterations would be automatically corrected in the way I suggested. When the town, the corporation, or any individual wanted a plan corrected up to date, for carrying out an important work, such as pushing a Bill through Parliament, where they have got to show a lot of detail, they or he would go to the district office of the Ordnance Survey which would do the work for them; bring the maps up to date more cheaply than anyone else.

1032. And that would require an immense extension of the present Ordnance Survey Department?—I do not think so if it were acting continuously; the changes are continuous, and they could follow them up as they take place; they could be steadily at work in the revision department. It would not take them as much time to do the revision year by year as it takes in cost and staff to do it every 40 years.

1033. But every place would want them at once?—Yes, but each would only want a little at once; it would not want the changes taking place in 40 years mapping; only the changes from year to year.

1034. (*Mr. Roby.*) Yes, but that would mean transferring the surveyors to new places continually. It would answer practical purposes if maps were kept up every five years, would it not?—That is what would take place generally, but in progressive districts you would get a good deal of work which the Ordnance Survey would be paid to carry out.

1035. (*Mr. Mather.*) Do you not think the Ordnance Survey Department, coming into relations with the local authorities, would jointly do it very accurately, and almost month by month through the year. Surely the local authority must come into connexion with the Ordnance Survey Department, because they have got the information at first-hand?—But then how are you to overcome that difficulty which I have pointed out of some authorities being more stingy than others.

1036. I quite agree with your plan that there should be centres for the supervision of the Ordnance Survey both as to town and country districts; but in addition to that it appears to me that the Ordnance Survey Department must make an arrangement with the local authority to have some information kept up day by day for their use; and that a local surveyor, I think, would do by his own staff without very much increase of their duties. There would be some extra pay for it, and a slight contribution made towards it. Then you would have it done, as Mr. Roby says, continuously; and perhaps it would be as well that a borough surveyor should come and give evidence?—Yes. There is one point I should like to mention, that is these new town plans, in some cases, show errors which seem to indicate a lack of very critical examination, I mean conspicuous things not important, but still very conspicuous, that the examiner ought to have noticed.

1037. (*Chairman.*) Town plans sometimes show serious errors?—Well, not serious in the way of being wrong or out of position; but I will give you an illustration on one sheet of Manchester. It was brought under my notice the other day. This will sufficiently indicate the nature of the error. It is liable to bring about doubts as to the accuracy of plans if things like this occur, and that is what we should guard against. Nobody should be able to impeach the accuracy of the Ordnance Survey plan. In Manchester we have a great many of these covered ways—loading ways. For instance, there is a passage through there, evidently a loading way. In the next sheet to this, No. 20, there are two loading ways to one building which are merely glass roofed, two glass sheds between the buildings, and they are shown on the map as solid buildings all over.

1038. (*Lieut.-Gen. Cooke.*) Could you give us the sheets with the exact errors noted on them?—It is the next sheet to this. I gave the number of it, I think it is Sheet 20. The errors are not of very great importance; I am not going on the ground of gross error; but if

people should use these maps, and see a thing of that sort, they say, "Well, if the examiners did not spot a thing of that sort, how can we rely on the accuracy of the plan in other points."

1039. Any other class of errors?—No, I do not think I have noticed anything else. I do not think I have noticed any gross error. But those things anybody would notice if they go over the ground; and in my anxiety that the plans should be unimpeachable by anybody, I should like to have an explanation why they occur. Major Johnston has already given it to you, but the public should understand why these errors occur sometimes, and then they will understand perhaps that they are not of any great importance; they do not affect the general accuracy of the plan. I would now propose to proceed to the 25-inch map. And I should just like to say about the definition of cadastral we had the other day, that it meant a map upon which plans of lands and buildings should be shown the natural size, but I think the definition which is given in that monumental work being brought out by the English Philological Society, under Dr. Murray's charge, the new English Dictionary, gives it very thoroughly. It goes into the history of the whole word, and derives it from the late Latin word *Capitulum*, meaning head, a poll-tax really, and that is the origin of the word, and the French adopted it. It has not come from the French *Cadastre*, as some authorities give it. I mean you have that on the authority of a great work, which I think anyone will accept as an authority.

1040. In fact, that French definition which we read the other day is about as good a one as you can have?—Yes, as a definition of what a cadastral plan is; I refer to the origin of the word. Then about these large-scale plans, the cadastral survey proper. There is one thing that has already been mentioned, that is the exceedingly high price where they are coloured by hand; whether some mode of showing the buildings other than colouring by hand could not be adopted. It makes these plans very expensive, and I think it interferes very largely with the sale of them. Of course they can be got uncoloured by waiting for them, but, as a rule, if anyone in the country sent down for plans of this sort he must always get them coloured. It is very easy to see the reason of that. Although the Survey have them uncoloured at Southampton, the agent's profit, and the profit of the Survey, I suppose, is greater on coloured plans than on uncoloured plans; therefore the public has to wait two or three days before they can get uncoloured plans, and generally those things are wanted at short notice. You are obliged to pay an extra price, and, of course, pay the commission on it too, the charge for colouring at Southampton and the profit of the agent on it.

1041. (*Mr. Mather.*) What is the difference?—This half sheet (*producing 25-inch parish plan of Eccles*) coloured is 6s., uncoloured 2s. 6d.; the adjoining sheet is 6s. 6d., uncoloured 2s. 6d.

1042. (*Mr. Roby.*) You think, Mr. Crook, that hatching is quite sufficient?—I think so.

1043. And the colouring, in fact, is for important purposes for which you use it, an inconvenience, because it prevents you putting colours on of your own?—Yes.

1044. (*Chairman.*) You would suggest colouring should be superseded by hatching?—Yes, sir, I had this map reproduced by photography for an address last night and thrown on the screen. The colours did not come out in photography, but all the buildings came out as clearly and distinctly as they do here. There is no difficulty in distinguishing them from the rest of the map.

1045. (*Lieut.-Gen. Cooke.*) Is there not a great objection to hatching buildings when you want to make great alterations on them?—If it is not too heavily done, there is no objection. There is more objection to colouring because you cannot apply colour. It is one of the slight complaints we have against the new maps of Manchester that the cross lining of the buildings is rather too black. They would be much better if they were shown like the old 5-foot town plan.

1046. (*Mr. Roby.*) Are those too strong for you?—Rather too strong; it is not a matter of much importance; but that complaint has been made. They were nicer on the old copper-plate—5-foot maps. Any colour, blue colour would show perfectly clearly on that map. I think the high price for coloured sheets interferes a good deal with the sale of the maps.

Mr.
H. T. Crook.
C.E.

18 May 1892.

See Wilson.
p. 220.

See Wilson.
p. 220.

See Wilson.
p. 220.

Mr.
H. T. Crook,
C.E.
1 May 1892.

1047. (*Lieut.-Gen. Cooke.*) But if the agent were compelled always to have uncoloured sheets in hand would not that meet the difficulty?—Well, you see from Sir Charles Wilson's evidence the enormous number of sheets. If the agent were compelled to keep coloured and uncoloured maps in stock it would amount to doubling the whole of his entire stock, and he would have to build a new place as his present house would not hold them.

1048. (*Mr. Roby.*) The better plan would be for the agent to keep the uncoloured and only get the coloured in case they were specially demanded?—Really that is what we want; but then the uncoloured ones are not useful for the general public. They do not understand them. It requires a competent man to colour a map.

1049. You consider that, for general use, what you want is a map with some hatching to distinguish the buildings, but without colour?—Yes, hatching is necessary. The uncoloured maps on this scale have no shadow lines. Even a technically trained man would have some difficulty in colouring that map if he got it uncoloured.

1050. (*Lieut.-Gen. Cooke.*) It is very difficult to distinguish gardens and yards from houses?—Exceedingly difficult. I have worked with these plans uncoloured, and I have found great difficulty in distinguishing a building from a yard.

1051. (*Mr. Roby.*) Light hatching answers the purpose?—Yes, light hatching answers the purpose.

1052. (*Mr. Mather.*) The other map of this scale simply shows the outline—no hatching at all?—That is all—no hatching at all. It is simply this map uncoloured.

1053. (*Chairman.*) You would not object, if hatching is introduced, to all the plans being issued "hatched"?—No, I think not; I should be perfectly prepared to pay another 6d. for it.

1054. I mean from the point of view of the utility of the map. You would not want them in two forms—one plain and the other hatched?—No; I think the fewer forms we have, so long as they are not absolutely essential for important purposes, the better. Have one system and stick to it. Find out which is the best and then stick to it instead of having a number of copies slightly varying. That is really one of the great blots upon our Ordnance system, that we never adhere for any long period to one system of producing anything, and we never get a uniform map. For instance, in this case, the sheet which takes the greater portion of Cardiff, it happens to be almost the centre of the town; that sheet cost 18s., and you are not likely to get the citizen to pay 18s. for a map if the uncoloured is 3s.; and it might be hatched for sixpence. 3s. 6d. is a price you could reasonably ask the people to pay for a first-class map of this kind.

1055. I see the point that when it comes to be coloured it is almost a prohibitive price?—It does not matter in country districts where there are fewer buildings on it, it is only urban districts, and especially for schools, where you would like to have a large map like this for teaching map reading and the beginnings of geography by a good map of the neighbourhood. The maps ought to be made cheap and serviceable.

1056. We will go on perhaps to your next point?—About the revision of this map. I have brought these maps because they are the only ones of Lancashire we have yet on the 25-inch scale. All these were made under a special arrangement with the Ordnance Survey, surveyed in 1876. Eccles, where I then resided, paid the Ordnance Survey to have this 25-inch survey in advance; you see we got it 15 years ago. Well, now the new sheets are beginning to come out, they have come out all round this sheet; but this map has not been revised, so we have got a map in the middle of this important district which is 15 or 16 years old and the surrounding part is 1889. We have to put this in juxtaposition.

1057. In fact at your own expense you advanced the national survey, and the result of that is that you are behindhand?—That we have got the most important part of our district in the centre, 15 years behindhand, because we contributed to the Survey 15 years ago. That, I think, seems rather hard lines upon the people who have contributed to it. Of course in any revision scheme where the towns were willing to contribute like that it would materially assist the Survey in correcting. It is a very progressive district this.

1058. (*Sir A. Geikie.*) But when was the last part of the survey finished. How soon after the publication could they have taken up the revision of that sheet you speak of?—I presume it has all been revised during the new survey; the cadastral survey of Lancashire and Yorkshire, which began some four or five years ago, began in this neighbourhood of South Lancashire, and all this neighbourhood has been re-surveyed, yet on this map the house in which I resided is not shown. There was a trigonometrical station in my back garden for the re-survey; all this district has been re-surveyed.

1059. (*Chairman.*) Did they not re-survey for the 25-inch map those portions of the counties already mapped on the 25-inch scale?—They re-surveyed Eccles certainly; every portion of the plan was re-surveyed only two or three years ago.

1060. But not published?—It is published on the 1/60 scale, being a town of more than 4,000 inhabitants.

1061. (*Sir A. Geikie.*) This is the old subject of the revision being all behindhand?—Not all behindhand. The whole of Lancashire has just been re-surveyed; but take Lancashire in certain places: a portion of Withington near Manchester was surveyed; there was a portion of Walton-on-the-Hill, a parish near Liverpool, surveyed; there was a part of Clitheroe surveyed; and when the 25-inch scale is published they will all be behindhand, because like Eccles some time ago these different districts paid to have it in advance.

1062. (*Mr. Roby.*) You would hardly put that as a reproach on the Survey, that when they met the wishes of particular localities it necessarily meant that some other part was postponed?—But should it do so when those districts have already had to pay for the survey.

1063. (*Chairman.*) That was the point?—Oh, yes, I think the point is clear enough. Then there is another thing, sir. If we had the revised sheets on this scale now it would give the Committee a very excellent idea of the change which would take place in the proposed revision period of 15 years. There is a fairly progressive urban—semi-urban—district and the revision period approved of by the Treasury, and, I believe, advocated by the Director-General—15 years—the new survey put side by side with that would show accurately the amount of revision and the amount of change that takes place in that fairly progressive district.

1064. (*Sir A. Geikie.*) What I wanted to know from Mr. Crook was what length of time has elapsed since this revision; has there been any more than reasonable time to undertake the sheets that you refer to?—The sheets all round are out.

1065. It was a fresh survey; they would put that before revision. What I want to know is, do you think there has been more than a reasonable time for them to complete the revision of these sheets?—I should say so.

1066. The new map is just out now; do you think they have been too long over it?—It seems to me a long time.

1067. That is the point; I want to know do you think the time unreasonable; how long have they been since they completed the survey and published maps all round without publishing that?—I think the maps were published two years ago.

1068. Do you think two years an unreasonable time for the revision of that map?—For the revision of that map?

1069. Yes?—I do not see why it should take so long. It has been revised and published on the town scale; it is only a matter of reducing it; it is not plotting it on the 25-inch scale.

1070. (*Chairman.*) When was the town plan published on that scale?—I could not say.

1071. Some years ago?—No, quite recently.

1072. Do you think that simultaneously with the publication of that town this 25-inch plan should have been revised; could it have been done?—I think it is a pity to publish new sheets with a portion of old work upon them. When Eccles was surveyed in 1876 they stopped at the boundary, therefore half of each of the sheets before you is blank; the work stopped at the boundary of the township which paid for it. Now the entire area within the margin of this sheet has been re-surveyed; but it is only published of those portions not published before up to date, and all the Eccles portion is 15 years in arrear.

1073. Is that so?—Yes.

See Wilson,
p. 220.

See Wilson,
p. 220.

See Will-
p. 220.

1074. (*Mr. Mather.*) On the same sheet?—You could buy this portion of Worsley parish re-surveyed, but Eccles is left as it was.

1075. They have printed the old with it?—They have printed the old with it.

1076. Is there any notice on the sheet that this certain portion of it has not been revised for 15 years?—I think it is stated now. A portion of Eccles was surveyed in 1876. Putting the date of the survey on is one of the minor reforms I have advocated all along.

1077. It is not really misleading therefore?—No, there is nothing misleading about that, because the date of the survey is put on. But if we could get these two sheets to compare them it would be a very valuable indication of the amount of work that is wanted for revision. The Department should give us information as to the number of sheets sold; whether the price has a very great effect on the sales. You would naturally expect that some of these plans of a district like this would sell better than they would in the country districts.

1078. (*Chairman.*) I think we will get a return of the sheets sold?—You will get a return, yes. Then again, with regard to this map, what I have advocated with regard to the whole series of Ordnance Survey maps applies, namely, the symbols used should be explained. All these little things should be explained; but I think Sir Charles Wilson said there was some difficulty in finding sufficient room on the margin to explain all these various signs that are used. Some of them are, the bench-mark is described. This little coupling puzzles people not accustomed to map reading; the sort of "f" that runs across, which shows that they are taken into the one lot in calculating the area.

1079. Instead of the public being obliged to buy a little book of signs, which is published, I believe, it ought to be put on the map?—There is a sheet of signs to every class of map. You cannot teach people how to read the map by explanation on the margin; but I mean a thing like that to a person not accustomed to use maps is rather puzzling. The different styles of boundaries, a county boundary and a parish boundary, &c., ought also to be explained, because these maps are very important for boundaries; it ought not to be difficult to explain them.

1080. (*Lieut.-Gen. Cooke.*) Sir Charles Wilson gave as his principal reason that there was no room on the margin; but do you think there would be any objection to putting the symbols in a row?—I think not.

1081. In that case there would be plenty of room?—I think it would be exceedingly convenient.

1082. Of course the difficulty of putting them altogether is that you have not space here to put the table?—Quite so; it is a difficulty.

1083. You might put them in a row at the bottom, there would be room for them?—Oh, certainly. Even for one so accustomed to use maps as I am, offhand I could not say sometimes from the particular kind of class of dot used what it is, whether it is a township boundary, parish boundary, or a county boundary. It is rather difficult to say offhand what a boundary is, unless you have them notified on the border.

1084. (*Mr. Mather.*) You brought up the same question in connexion with the roads you remember?—Yes, that was on the smaller-scale maps. Here on the 25-inch, the road, by its width and general appearance on the map, pretty well indicates the nature of the road.

1085. Is that a foot road?—That is a good footpath.

1086. What is this?—That is only a footpath; it is not metalled or anything; it is not a public road either.

1087. How would anyone know whether that was a road over which one was allowed to drive?—You are not allowed to drive over it. You could take a light cart up there, but there are gates across showing it is not a public thoroughfare, except in regard to the pathway; but there is no right of way for vehicles.

1088. How do you know that?—From my knowledge of the locality; the map gives no indication of right of way.

1089. Apparently that is a foot road or a farm road; how would you know that that is a road over which anyone might be allowed to drive?—On the ground you would probably very soon see. I think Sir Charles Wilson very clearly explained that it would be utterly

impossible to show whether the public had a right of way over any particular track.

1090. (*Chairman.*) In fact you would want those signs (*pointing to sheet of characteristics*) which are at the bottom put on the margin?—Some of them; you could not put the whole of them; you could not get all that in.

1091. You could get that lower half sheet?—You could get the more important portions of it. These little signs people are puzzled by and the meaning of the boundaries, I think. I do not think there is anything more on those 25-inch maps except that I think everybody admits the value of them and the use of them, as I said the other day in general evidence, not only for the landowners but for every purpose.

1092. (*Lieut.-Gen. Cooke.*) As a rule you have found the maps very correct, have you not? You have pointed out those little discrepancies in one of the maps, but as a rule have you often found mistakes in the Ordnance Survey?—With the large cadastral plan and the 6-inch maps very seldom indeed. I think the errors in these large-scale maps are not more than would be due to human fallibility in all things.

1093. And I suppose a very large number have passed through your hands?—A considerable number. I have had a good deal of experience in various parts of the country; in fact that is what drew my attention originally to the defects in the Survey. I was in the south-eastern counties, then in Wales, where I found a different state of things, in Ireland another state of things, and then in Lancashire, knowing our conditions there, it was impressed on me that in every portion of the kingdom the Survey was in a different state and the plans were produced in a different manner; but with these large-scale plans I think errors are exceedingly rare. That is the reason I dwelt on that small point in connexion with the town plan of Manchester; because I am afraid if the public sees anything of that sort they may be inclined to say that the Ordnance Survey is not worth anything if it cannot see the difference between solid buildings and glass sheds, and it is liable to make people doubt the accuracy of the map, which they really should have no cause to doubt.

Coming to the 6-inch maps, I think here we have an illustration of one of the charges frequently brought against this Survey, that if 40 or 50 years ago they could produce maps like these sheets of Lancashire—

1094. (*Chairman.*) Are these the engraved sheets?—Yes. The engraved sheets and these you are compelled to put in juxtaposition with photo-zincographs. Take a county like Derby, which almost touches Lancashire, down to the south of Stockport, then you see what looks like a degradation of the Survey during the 40 years, and people wonder why it is. They do not understand the necessities of the photo-zincographic process and so on. To the engineer and anyone who wants information about ground, and I suppose to the geologist also, it appeals very importantly owing to the diminution in the number of contours given. For instance, these maps (*6-inch Lancashire*), supposing these contours were put in in colour, you would have a perfect delineation of the configuration of the ground.

1095. Let us first take the first point, degradation; what you call degradation is simply due to the changes from engraving to photo-zincography?—Yes, that is one step, then worse paper and worse style of map, and fewer contours.

1096. Is it a worse paper?—Oh, distinctly. I am comparing 6-inch with 6-inch.

1097. You are aware that there are greater advantages in rapidity and cheapness in photo-zincography?—Oh, yes, I am, sir.

1098. Would you sacrifice time to beauty?—No, I would not; I think if we could get the maps at the same price and we had not to pay 60 per cent. more for an inferior map—

1099. You think the change is justifiable except as regards price?—Quite justifiable except as regards price. I think it is rather a curious anomaly that we should have had this map with a great deal more information, a much more valuable map, because of the contours, for 2s. 6d., and should now have to pay 4s. for the same area with much less information, and very much inferior artistic merit.

1100. That is due to the method of charging expenditure?—Yes, that is due to the curious system that, whereas the whole cost of the engraved map is excluded in regard to the time taken in producing the plate, and after that you have only got the paper

Mr.
H. T. Cooke,
C.E.

18 May 1892.

See Wilson,
p. 220.

Mr.
H. T. Crook,
C.E.

18 May 1892.

and printing; in the new form, which is dearer, you have really got the costs of the creation of your map.

1101. (*Chairman.*) The cost of the process of the creation of the map; and that, you think, is not proper?—I do not think it is proper. The sale of the maps does not repay the total expenditure on the production of maps in this country, from the Survey down to the actual appearance of the sheets in the hands of the public—the sale price does not pay for the cost of the work; then why should the State pay more in one case and less in another?

1102. You think the Treasury should contribute to the capital cost a certain portion of the costs of the 6-inch map as now produced?—Certainly.

1103. (*Mr. Mather.*) What is the difference in price?—For the same area the four quarter-sheets would be 4s. or 1s. each quarter-sheet, and here we have the entire sheets for 2s. 6d., a beautiful copper-plate engraving.

1104. (*Lieut.-Gen. Cooke.*) One other point to consider is this, it would be very often the case that people would want a 6-inch sheet, the area of ground they would want might be contained in a quarter-sheet, and you would only have to buy a quarter-sheet, whereas formerly to get that quarter-sheet you would have to buy the whole sheet?—That would be a consideration.

1105. (*Mr. Roby.*) And in regard to the detail you say used to be put in the sheets and now is not?—I am coming to that. What General Cooke has just stated is very important. I do not think it is very often that a single quarter-sheet would be required; it is very seldom I meet a case in which a quarter-sheet would meet what I require professionally, and it comes rather dearer if anything.

1106. (*Lieut.-Gen. Cooke.*) Supposing you had a property which took in four quarter-sheets on the present system, you would only have to buy four little sheets, whereas on the other system you might have to buy four big sheets?—In that case the new system would certainly work for the advantage of the purchaser of the map. Then the point about the 6-inch maps, that one feels more than anything else is the dropping of the contours, the serious diminution which took place in the number of contours after the report of the Committee, I think. I think both Committees were more or less responsible for it. I think the 1851 Committee advised that it should be abandoned altogether, and the Committee of 1862 recommended that it should be taken up again, but with a very much reduced number of contours.

1107. Giving up the interpolated?—More than that, they gave up some of the instrumental ones as well; the advantage of them is that very high hills, 1,500 or 1,600 feet hills that you get in the counties of Lancashire and Yorkshire, are given.

1108. (*Chairman.*) What are those contours, 50 feet?—25 feet.

1109. All contours are 25 feet?—Instrumental contours are at 50 feet intervals up to a certain point; 700 or 800 is the last instrumental one until you get to 1,000.

1110. What are the contours specially valuable to you for?—For all water supply investigations they are exceedingly convenient. I have brought some plans to show you how I have utilised the few which are given on the Derbyshire map, and the enormous advantage it would have been to have had a map like those of Lancashire. These are the Liverpool Waterworks, and you see any engineer without going on the ground could practically design these reservoirs without much trouble; he would have to examine the foundations for embankments, but so far as the office work is concerned with 25-foot contours he could practically see here all over this moorland district where he could or could not get a storage reservoir and of what capacity. Frequent contours are also exceedingly valuable for drainage works.

1111. (*Mr. Mather.*) And in connexion with the pollution of rivers, which is going on all over the country, this perhaps would be exceedingly useful, as showing the waterways?—Oh, exceedingly useful. I am using them in this particular sheet for another purpose; I am going to improve this road between two points—a railway station and a high road; the present route is exceedingly hilly. We have no 25-inch map, if we had I would have used that. I have enlarged the 6-inch to 24 inches to the mile, putting on the contours from the former. I have made various

sections to show where we should have to depart from the old line of road to improve it, to have a minimum gradient of 1 in 15, whereas at present it is something like 1 in 6 in places. The preliminary investigation of alternative lines was done in my office without any trouble at all.

1112. (*Chairman.*) Then bearing in mind that contouring is a very expensive work, do you think it is worth while covering the whole of this country with such minute contours merely for the sake of the largely exceptional cases for which they are used?—Well, I do not think the cases exceptional, sir, because if you have them on the 6-inch map you have them also for the 1-inch. When you come to that I am going to advocate that the 1-inch should have more contours, and this could be done by putting them on the 6-inch, of which the 1-inch is a reduction.

1113. Take this 6-inch on its own merits?—I have, quite. I do not think you save very much by dropping contours, because the number of instrumental contours which have been dropped is not so great, it is the interpolated ones which have been dropped which are comparatively cheap.

1114. (*Mr. Roby.*) Do you find the interpolated contours such as you could rely on?—Perfectly; there are only one or two cases where I have found them at all seriously in error.

1115. You are not advocating a great increase in the number of instrumental contours?—No.

1116. But a considerable increase in the number of interpolated contours?—Yes, a return to the style of 1845.

1117. (*Chairman.*) Contours are only 100 feet apart, and there are only nine of them?—Nine or 10; that is to say, there is one at 25 feet on the coast and lowlands. Another at 50, and then every 100 feet up to 900; after 900 there are no contours.

1118. (*Mr. Mather.*) How does that contouring compare with the French or German?—Of the French or German contouring on small maps very little is instrumental.

1119. (*Lieut.-Gen. Cooke.*) It is more like horizontal hachuring?—Especially in the Belgium maps, where they have contours every metre.

1120. (*Mr. Mather.*) Ours are therefore? as far as they go, much more reliable?—Oh, yes, certainly; in these two or three sheets which I have brought of Lancashire I think you have got the best; there is some excellent contouring here.

1121. (*Chairman.*) Is this the newest issue?—That is the only issue we have of these maps. The new ones will be in the quarter sheets.

1122. (*Mr. Brickdale.*) Is there much road-making above the level of 1,000 feet?—No, but the contours are very useful in waterworks, if you want to get at the shape of the ground. It is the only mathematical way of getting at the formations of the ground, which you cannot show properly by hill-shading. After all, hill-shading is only an improvement on the old pictorial way, the bird's-eye way of showing them.

1123. (*Lieut.-Gen. Cooke.*) The hill-shading on the Ordnance Survey is put in with great accuracy. It is based to a certain extent on eye-contours?—I think on some of those maps where we have both hill-shading and contours, the contours and the hill-shading are inconsistent; those which were used at Chatham the other day for the manœuvres there. The contours and hachuring are not in accord; they do not agree as to the shape of the ground. I wanted to point out that Sir Charles Wilson dwelt for some time on the enormous cost of contouring, but as the basis of hill-shading it is the best. To do hill-shading at all accurately you must have contouring also; and contouring in the high districts too. In the open ground in the high districts it would not be nearly so expensive as low ground, working in enclosed countries. When you get up on the moorlands the cost of contouring is much less than in the low districts, in the valleys.

1124. Have you taken into consideration that, in putting down the positions of the points of the contours in the hilly country, it is very difficult, because you have no data to go by. In the low country you have got a level in a hedge, and you have merely to measure from the angle of the hedge to that point; very often on the hills you may have nothing but a wandering stream to fix your level by?—Yes, but you put in certain points, do you not, and traverse between them

on the hill-side contours. I think the manner of operating is described in the official account.

1125. You are obliged to, because you have no features on the ground by which you could fix them?—Sometimes you have very definite features when you come to very steep escarpments, and that kind of thing. On the higher ground most of these are only interpolated contours and they are quite sufficient for all purposes up there. On the lower ground the 25 and the 75 between each 100 on these Lancashire sheets are interpolated contours. I would like to point out that it was the men of my own profession who really stopped contouring in England—Stevenson, Brunel and Locke, who gave strong evidence that the contours were not wanted. Sir Charles Wilson said they stated that contours were not of any use except they were instrumental contours and perfectly accurate. At that time there were plenty of men who would have given sufficient evidence as strongly on the other side. Contouring was not understood. Many people do not like a new thing, and it was rather an encroachment upon the engineer's province of making the maps used in carrying out large railway works if the nation produced a map which saved the cost of all these surveys they had to charge for. Surveys which would enable younger men without any staff at all or a very small staff to do the same work which kept their offices busy for 12 months.

1126. (Mr. Mather.) It was a case of trades unionism?—I think it was something of that kind, because Brunel said an engineer's eye was better than any contour. That showed the professional jealousy of having the work done for him. On the other hand Mr. Lewis Gordon, then Professor of Engineering in the Glasgow University, who wrote a report to Sir Charles Trevelyan in answer to questions that were put to him, gave the most valuable essay, almost the best essay on contouring that has ever been written, in which he pointed out the extreme value of the work.

1127. (Chairman.) Are those interpolated contours that you speak of put in by the eye or how?—By water-level, I think Sir Charles Wilson said. On very steep ground it is impossible to have instrumental contouring at all. These interpolated contours you could put in very often by the eye.

1128. (Mr. Mather.) And they are practically correct?—They are correct for all purposes for which you would use them. I will illustrate that. Here is a water-works scheme in North Derbyshire where 6-inch maps of different styles come together (*producing plan*). There is a little portion of Yorkshire in the north-east corner. On that you have the old contours, you see. Look how the slopes of these valleys come out in contrast with the Derbyshire side.

1129. (Chairman.) This is the old 6-inch?—The Yorkshire portion is the old 6-inch, the contours are carried up to the tops of the hills, and the value of those for engineering purposes, especially for hydraulic work, is enormous. You can see at once the kind of catchment ground you have got, and roughly lay out the lines of catchwater or intercepting conduits.

1130. (Chairman.) This is the old map?—Yes, the north-eastern portion—a portion of Yorkshire. This is a case in point showing the utility to the country generally of contours. Manchester went to Thirlmere for a water-supply—evidence was given in Parliament—there was strong evidence that there was no other ground available for utilisation in the neighbourhood of Manchester. This district was mentioned in the Parliamentary Committee as a district where a water-supply could be obtained. I am not going into the merits of the scheme but showing how useful these maps would have been in that particular inquiry. Every district in Lancashire and Yorkshire was said to have been searched and round about the borders; every district, even North Wales, had been looked at for Manchester, and there was no other available district but Thirlmere. Some one, Alderman King, I think, suggested this Derwent district. Evidence was given that it would require a tunnel 9 miles long to bring this water into the basin of the Irwell and the Mersey. During the water famine of 1884 I looked into the subject and advocated —

1131. (Mr. Mather.) What is this?—This is the head-waters of the Derwent in Derbyshire. I found that the tunnel which comes in here would only require to be 3 miles long. Instead of taking the water direct to Manchester, which lies over there, I proposed to bring

it round this way. There is sufficient water here to supply the whole of south-east Lancashire.

1132. You mean to say that if these maps had existed with contours probably the Thirlmere scheme would never have been adopted?—I do not think it would.

1133. We should have had water nearer Manchester and in greater quantity, and we should have had it long ago?—And we should have had it long ago.

1134. (Lieut.-Gen. Cooke.) I do not think an engineer could expect that he should have the whole of his reservoir contoured for him?—But he did have it before.

1135. I think that seems to me to have been rather an excess; but I think he has a right to expect that he shall be able to get his line of water from the contours on the maps. Now, what addition to the contours on the new 6-inch would have enabled you to carry out the line of the waterworks—not the details, but the main line—to see where the water was to come from?—Oh, well, this would suffice roughly for that, but one has to go to the ground a good deal and interpolate levels.

1136. It does not suffice quite, because you have not contours on the highest levels?—You would not want to make reservoirs on those levels.

1137. Would you not want to see the line of the water?—It is very important where you want to make any diversions of streams.

1138. You would want to see the line of the catchment basins up to the top of the valleys?—Yes. The boundaries of the collecting area would have to be walked over.

1139. But, as I said before, you are contouring hundreds of square miles for the sake of only a little bit?—It is not only for the engineers' uses, but you get a notion of the ground form for the geologist, and for the small-scale maps, for your topographical map. I think after the 1,000 feet the next instrumental contour on these maps is 1,250.

1140. (Chairman.) On the 6-inch?—On the 6-inch of Lancashire and Yorkshire.

1141. The 1,000 feet is an instrumental contour?—No. There is not one above 1,000 on this sheet, although it runs up to 1,250. There is no instrumental contour above the 1,000 here.

1142. The Scotch map is always contoured right up on the 1-inch?—On the 1-inch is it; in certain counties only.

1143. (Sir A. Geikie.) The whole country is contoured on the 1-inch scale?—Does it go above the 1,000 feet; I think it is only contoured at 250 feet after the 1,000, as in the English lake district. That is calculated to mislead people.

1144. (Chairman.) The English map is contoured?—On the 1-inch map of the northern counties up to the 1,000, and then every 250 feet after the 1,000.

1145. Up to the top?—Yes.

1146. You would ask that contouring should be carried right up to the tops of hills in England?—Not instrumentally. One instrumental contour, say, at the 1,000 feet, and then after that I think you might go on to 1,250, or something of that kind, before having another instrumental contour.

1147. At each 250 feet after the 1,000?—Yes, and the other contours might be interpolated, because at the top of the hills extreme accuracy does not matter, and contouring is comparatively an easy matter if they are sketched in. I think it is a pity to drop them; but you must not make your intervals larger as you get higher, because it is so misleading if you want to show the ground formation.

1148. Then we will take it like this. That you would like after 1,000-foot instrumental contours at every 250 feet up to the top?—Yes, sir.

1149. And intermediate interpolated contours?—Yes; keeping the same vertical interval always, never changing the vertical interval between contours.

1150. But you do change it if you go from 1,000 feet to 1,250?—In the case of instrumental contours increase the intervals.

1151. But you would get the interpolated contours as thick as the instrumental contours on the lower ground?—The instrumental contours on the lower ground are 50 feet apart on this Lancashire map.

Mr.
H. T. Crook,
C.E.

18 May 1892.

Mr.
H. T. Crook,
C.E.

18 May 1892.

1152. (*Lieut.-Gen. Cooke.* On the old map?—On the old map.

1153. (*Chairman.*) But on the new map?—I want to keep instrumental and interpolated contours clear, because the cost of one is greater than the other.

1154. The instrumental contours on the new map now being produced are every 100 feet up to 1,000?—Then there are no more.

1155. Then there are no more?—You would say that you would take instrumental contours every 250 feet, and interpolate the 100 feet contours?—Interpolate those between the hundreds right away from the beginning, from the first 25 up to the highest hill; I mean between the present instrumental contours of a hundred. Up to the 1,000-foot level the hundreds are done throughout the country, and there is a great body of the contours which you are going to interpolate, but the amount of work of laying out one line at 100 feet interval, and laying out another at 100 feet above it is much greater. I mean the frame-work is practically done. It is very easy to see where you are going to interpolate your other contours, very much less surveying will do. You have got it in outline if you have at every 100 feet instrumental contours as we now have constructed up to 1,000 feet throughout the country. Even the interpolation of another instrumental contour would be an easy matter, and the addition of the interpolated contours would be comparatively light. I could not say, not having experience of the survey operations, what the cost of these interpolated contours would be; but I think they would be well worth their money.

1156. You would continue the interpolated contours every 25 feet up to 1,000 feet?—Yes; so as never to lose the shape of the ground.

1157. On the 6-inch map?—On the 6-inch map, and when you reduce your 6-inch map by photo-zinco-graphy you would practically have it hill-shaded so that it would show the outlines of the ground more clearly.

1158. (*Sir A. Geikie.*) How would you do in the higher parts of the Highlands, where there are no topographical features, no streams, nothing to guide you; would you propose still to carry on the 25 up there?—It has been done in this case—Lancashire and Yorkshire.

1159. That is comparatively low ground?—There is a good deal of high ground in Lancashire and Yorkshire.

1160. I am talking of ground perhaps twice as high as that where you have no feature, nothing to guide you. Would you propose still to carry contours up to the top?—If Scotland did not want it there would be no need to go to the expense.

1161. I am not talking of Scotland; what is your opinion? Would you propose in the higher parts of the Highlands, where there are no topographical features, still to carry contours up to the top?—In the English lake district it would be most important. These English lake outline maps would be most valuable maps if thoroughly contoured so as to show the features of the ground.

1162. You would put your contours sufficiently thickly to be a substitute for hill-shading?—Yes, so long as you draw a distinction, and show that one is instrumental and the other interpolated. You are not misleading the public if there was any trifling error in the interpolated contouring.

1163. (*Mr. Primrose.*) Where the ground is very abrupt you have no room on the map to interpolate contours, have you?—No; they come very close together on some maps where the ground is very steep.

1164. Supposing you had a precipice of 1,000 feet?—If you come to a precipice the contours would disappear altogether. On the 6-inch map a precipice is usually indicated by hachuring a quarry face; for instance, here there is a quarry, and the contours run into the quarry, vertical hachuring shows that it is a precipitous place, and, of course, the contours lose themselves in that.

1165. The moment you get above 1,000 feet the chances are that the ground is very steep?—No. There are precipitous places, where the contouring would be lost, indicating that the ground was exceedingly steep at all levels.

1166. (*Mr. Mather.*) You would regard these contours of the higher regions chiefly as interesting and useful to tourists and travellers; but for public works they are not likely to be of much value?—I do not ask for instrumental contours on the very high ground. There should be an instrumental contour at the 1,250 feet, and if the remainder above were sketched in on the same principle as military maps are contoured that would perfectly suffice.

1167. (*Chairman.*) You do not object to contours obscuring the other parts of the map?—I do not think they do. On the 6-inch map I would advocate that the contours should be made more distinct; I do not know whether it is practicable, but I would advocate that they be printed in colours.

1168. On the 6-inch map in populous districts does it not obscure the features of a district?—I think not at all; not on these Lancashire maps. I do not think there is a clearer map produced in the world than these 6-inch Lancashire and Yorkshire maps. Here is a map near Wigan, on which I have strengthened the contours in red; that was really done for a Kriegsspiel map. You have the ground forms very distinctly there; that is a 6-inch map which is shaded in brown tint varying in depth according to the proximity of the contours.

1169. (*Lieut.-Gen. Cooke.*) You refer to the old 6-inch map of Lancashire?—The old 6-inch map of Lancashire simply shows you how well you can get the ground forms by putting in shading for the slope. If you have these contours you can do anything; you know all about the country, and every nook and cranny of it. There was one point before we leave contouring which I should like to ask your attention to, and that is that Sir Charles Wilson told me some years ago, in answer to a question which I put to him at a British Association meeting, and he has repeated it here in evidence, that a very large portion of the country has been contoured not only on the 100 feet, but at 5-foot intervals all round our coasts. A large sum of money must have been spent on that work. As a volunteer officer I have got my station on the coast where my company will go to when called out, and they send me, of course, as the officer in charge, that map which is contoured at 5-foot intervals, where I have got to construct the works; and that Sir Charles Wilson told me was done with the whole of our coasts and all districts that might be wanted for camps or stations in case of invasion; and he showed me the maps of the south coast of England at Southampton when I visited the works there.

1170. (*Chairman.*) How far inland does that go?—I could not say. It seems to me to go—

1171. How far does yours go inland?—Mine has only two or three acres in it on the coast. It is simply a special map sent to me for a special purpose; it is a section of the work which Sir Charles Wilson says has been done for the greater portion of our coasts and for all places where camps or stations would be required in the case of war. I mean there is a lot of work locked up at Southampton which the public does not get at all.

1172. (*Lieut.-Gen. Cooke.*) I expect for military reasons it is not allowed to be published. There is a good deal of work which for military reasons is not allowed to be published?—The details of the forms of ground within 25-foot contours, of course, are of very great importance from a military point of view; I do not think it would help foreign nations more than it would help ourselves.

1173. We do not want to help them at all?—It would help the people who want to defend the country more.

1175. (*Sir A. Geikie.*) What do you propose?—I only want to point out that a large portion of this work on the coast districts has been done. The 25-foot and the 75-foot contours have been surveyed. We might have these.

1176. (*Chairman.*) We have got the 25-feet on the map as it is?—Yes, on the old maps, not the later 6-inch or 6-inch.

1177. We have got the 50-feet?—You might have the 75-feet then from the coast survey.

1178. That finishes the contours, does it not?—There was one question you asked me. I had made a note of it on the statement which I had prepared. Another use of these maps and the advantage of contours. I had forgotten it when you asked me the question about

See Wils
1892.

engineers' work in designing waterworks. There was a case in 1866 and 1867, when the late Metropolitan Board of Works promoted a scheme of water supply of potable water for London independent of other supply. I was then engaged, with Mr. Baldwin Latham, on behalf of the millowners and riparian proprietors in the Thames basin, in opposition to the scheme. I carried out a hydro-geological survey of the chalk districts in the Thames valley and of the south side of the Thames basin, and a thoroughly contoured map there would have been exceedingly valuable; not only for those who were engaged in opposition to the scheme, but also to those promoting the scheme—valuable as giving the true gradient of the ground, it is important in the chalk districts in following the water contours—the water contour in the chalk system follows to a certain extent the ground formation. Where the ground is higher the line of the water saturation would be higher also. A really well-contoured map of that district would have been of immense advantage.

1179. You had a 6-inch map at that time?—We had the 6-inch map at that time, but then it was not contoured like these maps of Lancashire.

1180. Not sufficiently contoured?—Not sufficiently contoured. For instance, if we had been able to obtain a map such as this map of Lancashire for the work on which we were engaged it would have saved a great deal of levelling and of notification on the ground. It would have been valuable for the Committee in assisting them to arrive at a right conclusion, and that was important for the whole of the population of London.

1181. The Committee would have had the aid of the maps independently of the evidence brought before them in coming to their decision?—Yes.

1182. And the contouring is inadequate for that purpose?—Is inadequate for that purpose; it would have given us a great deal of information about the streams and the sections of the streams, and so on, if it had been contoured every 25 feet. And then, in another case which I had lately, in the Mersey and Irwell watershed, where I had to do some work for the Manchester Ship Canal directors about the pollution of rivers, I found them most valuable. You practically have the level of the river every 25 feet, and, of course, the engineer's eye, of which Mr. Brunel spoke, is capable of estimating a small fall at a weir, or anything of that sort. It is possible to get a section of the river without the trouble or expense of surveying it, which could give you a complete history of the river. In the case of Lancashire it is very ancient, but still valuable; if it had been brought up to date it would have been still more valuable.

1183. The rivers are the same?—No, the rivers have changed very much; there is nothing more interesting than the frequent changes of the Irwell and Mersey arising from the erosion of the banks—sometimes a bend is cut off entirely, very often rivers change to the other side of the valley. It is very extraordinary to notice in a river so much utilised and bound up by walls how it can change within 40 or 50 years.

1184. (Mr. Mather.) You know the Lancashire County Council is engaged in an inquiry into the watershed of these two rivers, the Mersey and Irwell, and their tributaries, for the purpose of going into this question of the river pollution; the maps they will use will be the old maps which give the contouring of many years ago, and therefore they will have to make special surveys, I presume, at some points where the river crosses the correct data?—Yes. I wanted large maps of Ramsbottom; it was impossible to obtain them then; the town plans were not out. In river work, where you pass through large towns, you want large town plans, but in country districts the best map for that kind of work would be the 25-inch, the cadastral map with the contours transferred to it.

1185. Which is not available now?—It is not available now, but it will be. I have made a hill-shaded map of South-east Lancashire, showing the basins of the Mersey and Irwell by tracing the contours of the 6-inch, and bringing out the ground features by shading in brown.

Then there was the proposal I made, and which I understood the Director-General to say will be carried out shortly, that is, producing handy maps of the towns on the 6-inch scale.

1186. (Chairman.) Combined maps?—Combined maps; yes, where the four sheets combine in the centre of the town.

1187. He said it would be done?—He said it would be done. That is the kind of thing which appeals to the public very much and which I understood from the Director-General himself, when he wrote to me at Leeds, was not in accordance with the general directions under which the Ordnance Survey was carried on. It would be rather interesting to arrive at, who is the authority who alters these things and originates these improvements.

1188. The whole of the Isle of Wight is a combined map?—The whole of the Isle of Wight is a combined map. It was published I think in the old edition of the 1-inch. Districts like that one the Director-General brought the other day of Brighton on the 1-inch; such maps ought to be produced on the 6-inch also. It is not the business, or, it appears, not to have been hitherto, of the Ordnance Survey to do this work, which appeals more particularly to the public. When it does start upon it, it ought to stick to it and do it in the same way all over the country, and not chop and change about. It is difficult to find out who authorised these combination-maps, and on what ground they authorise them; it is very important to arrive at the reason why you are going to undertake a certain work, and then to stick to it and do it uniformly.

1189. I suppose you would say the Map-making Department ought to settle whether they would produce a combined map by general conditions of convenience?—Yes, and then produce them in a uniform manner for the various places for which they are required.

1190. The 6-inch maps, produced as they are in quarter-sheets, you hardly want to make any alteration upon?—No; but where they are produced in quarter sheets there is no reason why you should not have it of any one sheet. I think a combined map is very convenient to get of a town; for instance, Manchester is very fortunate in that respect. I think it comes on sheet 104 of this 6-inch map at present, and this affords an excellent map of Manchester, the new 6-inch will be cut in four.

1191. You would suggest that the quarter sheets that are necessarily produced as quarter-sheets for the purpose of photo-zincographing from the 25-inch map should then be re-combined occasionally into a large sheet?—Yes; so as to give a good town plan.

1192. (Lieut-Gen. Cooke.) Putting the towns centrally of course?—Putting the towns centrally. In several of the quarter-sheets towns come pretty centrally. Bath comes right in the centre of a quarter-sheet, and for a shilling you get a very convenient map of Bath. Then there is one other matter which I think is very important in the utilisation of these maps, and that is the whole of the 6-inch maps of the kingdom at present terminate at the county boundaries, except the very recent ones, where a portion of the contiguous county is filled in, but still it does not extend beyond that. Each county in the United Kingdom is surveyed as if it were a separate state, or an island; it is plotted to a different meridian, and it is utterly impossible to combine the sheets.

1193. (Chairman.) Is that the cause of any serious difficulty?—It creates very serious difficulty, and it makes very serious expense.

1194. Do you know the meridian adopted?—The meridians are different for different counties unless they lie right over one another.

1195. No, for a large number of counties in England there is a single meridian. I saw the meridian map yesterday. Perhaps you have not seen it?—No; I have not seen it. I should have liked to have had it produced, still it comes to the same thing, the meridians are different when the counties lie side by side, but the same meridian will do for counties which lie north and south; that is the principle which guides the selection of a meridian. It does not matter what the exact number of the meridians may be. Each county is plotted to a particular meridian, irrespective of its area or of the position and direction of its boundaries, a very serious thing in an enormous county like Yorkshire, bounded on the west by a comparatively narrow county, Lancashire, plotted to a different meridian. The meridian of Lancashire is, I suppose, a pretty central meridian taken for the county. I do not know that it is what is known as the Delamere meridian. The central meridian passes through Yorkshire somewhere between York and Knaresboro', therefore at the junction of Lancashire and Yorkshire there must be

Mr.
H. T. Crook,
C.E.

18 May 1892.

See Wilson,
p. 229.

M^r.
H. T. Crook,
C.E.
18 May 1892.

disagreement. From the central meridian of Yorkshire to the western boundary of Yorkshire is a greater distance than from the central meridian of Lancashire to the eastern boundary of Lancashire, therefore the distortion at the junction of the two counties is different. In the one case the boundary is 50 miles from the meridian, and in the other only 10 miles.

1196. It must occur somewhere?—Yes, but there is no reason why it should not occur on a straight line; I see no reason, unless there be some technical objection in the way or difficulty in producing maps or something with which I am not acquainted, but I see no objection to sectional meridians running, as you have just said, —three or four running from north to south throughout England.

1197. I was informed yesterday that every sheet now which extended beyond the county for which a particular meridian is selected is completed from the adjacent county in accordance with the meridian for the county which forms the main part of the sheet?—Yes. That is the small portion which is transferred to make up a sheet.

1198. And then a difficulty does occur when you come to join the next sheet to it, because the next sheet is on a different meridian, but at some point or other that must occur, and as these eastern and western boundaries on the sheets are always straight lines you have arrived at your suggestion?—No, sir, we have not done that, because the utilisation of one meridian stops at the county boundary, and if the county boundary, as it does between Lancashire and Yorkshire, runs north and south for a long distance, and then runs almost east and west for a long distance and then turns southward again, the sheet lines upon which the change takes place will not correspond at all, and not only are the two county maps plotted to different meridians, but the sheet lines are utterly different.

1199. (*Lieut.-Gen. Cooke.*) How are you to avoid the meridian question, unless you publish the 6-inch map on one meridian only?—I should do the 6-inch map on three or four meridians.

1200. (*Mr. Roby.*) Did you understand that they fill up the map, those are these places where the two counties join?—Oh, yes, but that will not enable you to make a map of an important thing like a river basin.

1201. (*Lieut.-Gen. Cooke.*) Unless you have one meridian for the whole 6-inch of England?—If you will let me explain it to the Committee again I think I can make myself clear. Suppose that we had the width of England divided into a certain number of meridians, and from these meridians we plotted 30 miles east and 30 miles west, and from the next we plotted 30 miles east and 30 miles west, quite irrespective of county boundaries at all, then the whole of the distortion would come upon one line of junction, a straight line, and the amount of the distortion being equidistant from the respective meridians would be exactly the same on both sheets instead of following a straggling boundary.

1202. (*Chairman.*) You now get the difficulty irregularly undoubtedly?—Because you intensify it so much that the sheets of Lancashire and Yorkshire do not correspond, Lancashire and Derbyshire, or Yorkshire and Derbyshire, you very often have a 1/16th part of a sheet, or something of that sort to join up with it. I brought this with me. This is the junction between Lancashire and Yorkshire, and this little bit of Yorkshire (costing 2s.) has got to fit in with Lancashire, you can never fit that on with the Lancashire map. This is the extreme easterly sheet of Yorkshire (*showing maps*).

1203. (*Lieut.-Gen. Cooke.*) Cannot you dodge it a little?—It is very difficult indeed; I will show you a junction of maps which is very striking. I think it is a matter that is worthy the attention of the Committee because it interferes so much with the utilisation of the maps, the present system. Here you have the 6-inch sheets of Cheshire and these are quarter-sheets of Derbyshire, part of the river system of the Mersey. This stream flows down into the Mersey, the Goyt, one of the tributaries, and you see it is impossible for any engineer or any person engaged in pollution investigation or hydraulic works to get a proper map of the river.

1204. (*Chairman.*) The fault at present is this, no doubt it arises from the piece-meal way in which the survey was undertaken. Surrey has one meridian line, Middlesex another, and Kent again has got another. On the other hand right through the centre of England

you have got a large strip on the same meridian?—That is the Delamere meridian, it is called the Delamere meridian. The one-inch new series is constructed on that meridian.

1205. Then you have a Welsh one, this has got a separate meridian?—Extending to the far west I suppose. The reason of it is that there was a central meridian for each county, then these were all later surveys.

1206. (*Lieut.-Gen. Cooke.*) This is rather more theoretical than practical?—The only thing is whether in our future revision it should not be held in view.

1207. Everything would have to be destroyed and everything done *de novo*?—I think not, only such portions of the country as are required to straighten the line of junction between sections plotted to different meridians. For instance, the Lancashire and Yorkshire meridians would still be used for the greater part of their respective counties, there would simply be an adjustment about the line of meeting, portions of West Yorkshire would have to be adjusted to the Lancashire meridian.

1208. (*Chairman.*) Can you tell us what would be the difference in length of the degrees of longitude for each degree of latitude?—No, I could not tell you, sir, because that is a thing I have not worked out.

1209. (*Lieut.-Gen. Cooke.*) You have tables of the length of all degrees of longitude for every degree of latitude?—Yes.

1210. Is it not rather academical?—It is not so; the change I suggest would greatly increase the utility of the maps by obviating difficulties which now occur frequently in making respectable maps of very important districts. A river map such as I wanted for the rivers of Lancashire and Yorkshire, and such as Mr. Mather suggested, will be wanted for the Rivers Pollution Committee of the Mersey and Irwell. You cannot get a proper river map under the present patch-work arrangement.

1211. (*Chairman.*) A river running east and west gets into serious difficulties?—It is not only the difficulties for mill-owner's work; there is really no true picture of the river, it is made up of a number of maps pieced together; it is quite impossible to get a true plan of that river, or even to use it for the purpose of putting any information down. Suppose you were desirous to improve that river and divert it, it all comes on the junctions of these maps carried out in different styles on different sheets, and plotted to different meridians. There is also the expense of all these numerous sheets.

1212. What is the next point?—The next point, I think, is that in some of the reductions—I do not know whether this will occur in the Lancashire reductions—to the 6-inch from the 25-inch, old and new work has been mixed up. Whether, for example, the case of Eccles, which I was dwelling upon, upon the 25-inch map, will be a repetition of what has happened in Torquay, where the town survey was made, I suppose, for some special purposes in 1862, and now the 6-inch survey has just been published. Three quarters of this sheet 116 S.W. is a survey of 1858, and the most important part of Torquay is a survey of 1862. There is a difference, as you see, of 26 years in one portion of the sheet and that the most important portion of the sheet. The junction you can distinctly see on that sheet; you can see the ancient quarter-sheet.

1213. (*Mr. Roby.*) In a rapidly growing district?—In a rapidly growing district—in an important town.

1214. (*Chairman.*) That shows the necessity of revision?—Well, rather more than the necessity of revision; it is a question whether revision should not be undertaken at once in a place of that sort. I cannot understand why a town like Torquay should escape its survey because it chose to pay for it, and have it made 20 or 30 years ago as we did in Eccles, why it should escape revision for this new 6-inch map which is produced and issued as a new map.

1215. (*Lieut.-Gen. Cooke.*) Then you must remember if Torquay had been re-surveyed you would have had to give up the survey of a town that had never had a survey, because the Ordnance Survey does not get unlimited money, and if they had devoted some portion of the money to the re-survey of Torquay perhaps they would have had to give up the survey of a town that had never had a survey at all?—Then would it not be getting a survey on the 1/500 as a town of more than 4,000 inhabitants.

See W.I.
p. 220.

1216. But Torquay had a survey on the 1/500 scale?—But the new survey would have been made at the time this was made.

1217. (*Chairman.*) No, they got it 20 years ago, and paid for it in advance?—On the 25-inch scale, I think, not on the 1/500, they would get their new town plans or they would get a revised town plan at the date of that survey of 1888.

1218. The object held in view has been to produce some sort of map of all England, and not to give preference to particular places?—It was exceedingly misleading, until a suggestion I made some years ago, that the date of the survey should be on every map, was adopted. Now we have got the date here, and that shows the weakness of the map. But the objection that Mr. Roby made about "1866 to 1888" holds good of this one, and the new ones also surveyed between 1879–89, where corrections have been made in one place. For instance, that sheet of Brighton on the 1-inch map Sir Charles Wilson showed us the other day, it says "surveyed in 1873–91."

1219. You want a more defined description as to date of survey?—Yes, I think that is the way to put it, sir.

There was one suggestion which I have heard made that these indices to the towns on 6-inch scale would be very useful if they were published as skeleton maps. For instance, we shall not get the 6-inch map of most of the Lanca-hire towns for a long time; probably if this sheet at Manchester were published without sheet numbers it would be a very useful map for showing alterations in towns, and new works, railways, or streets, or anything of that sort; as a diagram it might be published as a light sheet.

1220. What is the scale?—Six inches to the mile, indices to the new town plans. If they were printed on one sheet and printed separately without the figures, or with the figures very much smaller, it would be very useful as an advance of the 6-inch map. It is only a diagram, but it would be very useful; it is practically produced; it is all on the plate.

1221. You might produce it with the sheet lines?—You might produce it with the sheet lines; there is no objection to the sheet lines at all, these large numbers disfigure the map for any practical purposes except as an index.

1222. (*Lieut.-Gen. Cooke.*) It can be bought like that at present?—Yes, with the numbers on it. I bought this, the numbers are too big they disfigure it so much, if you want to use the map for any other purpose than an index.

1223. (*Mr. Mather.*) What you think is that they are too big?—Oh, no, as an index it is all right to have the numbers, but we shall not have the 6-inch for some time.

1224. (*Lieut.-Gen. Cooke.*) Your proposal apparently is to publish these indices as a map which would be necessarily incomplete. Would not this be open to the objections made to the 4-mile map?—It would only be a skeleton map. Of course, it was only a suggestion I have heard thrown out by one or two people who have a good deal of work to do in towns, and I thought I might as well bring it before the Committee. Well, I think, sir, that that is all I have to say on the 6-inch survey.

1225. (*Chairman.*) Then will you go to the 1-inch?—I think it is pretty well admitted now the necessity of a new 1-inch map, I mean to say it does not require very much demonstration.

1226. No, it is being produced as fast as possible?—A stopgap production is being produced; we have not got up to the ideal topographical map of England which I think most geographers and map-users are anxious to see, and which all continental nations have. The great blot on our survey at the present moment is that we have not yet produced a fairly respectable uniform topographical map of England, and we ought to have it.

1227. Yes, all the southern counties ought to have a new map. As regards Lancashire and Yorkshire they have a 1-inch map which is called the new 1-inch map based upon their survey of 1840 to 1850?—I think that portions of Lancashire and Yorkshire have.

1228. But that will be the 1-inch; they are not going to have the new one?—They are not going to have a new one, although it is worn out in many places. What is called the new 1-inch map of the northern counties is quite worn out, and for other portions of

England this advanced edition by photo-zincography is a mere apology for a map; I mean to say it is disgrace to a nation like ours to produce such a map as that in comparison with what they have abroad.

1229. Do you go so far?—Of course it is useful as a stopgap map; but what I am very anxious to guard against is the danger of the Treasury making it an excuse for never giving us a respectable topographical map of the United Kingdom.

1230. Considering that the manuscript map is founded on surveys which are already old, and that this zincographic copy of it is a cheap production and covers all the ground, do you think it is worth while to incur the expense of engraving that map in order to produce a beautiful map?—I do not think so, but I think we ought to have a proper map like the French have three or four of, and the Germans are producing, the Austrians have, the Norwegians have, on three or four different scales, a good uniform topographical map of the United Kingdom.

1231. (*Mr. Mather.*) How would you produce that?—By some of those foreign processes. I am not sure of the technicalities of all those processes, but that map we have been looking at many times, the vicinal map of France, might be taken as an example.

1232. They are all reductions from larger scale maps, are they not?—No, they are not, they are drawn upon the scale on which they are published.

1233. You mean they are drawn upon a larger-scale map, and then produced by a process which is equal to our engraving?—No.

1234. How are they produced?—When I began my evidence the other day, I said that was the great distinction between our English small-scale topographical maps and all the continental maps. Nearly all the continental maps are drawn in manuscript on the same scale as they are published.

1235. The original drawing is on the scale on which they are published?—On which they are published, yes. In some cases, for instance, in this Norwegian one, it was published on the 25,000th scale that would be about 2½ inches to the mile, and then reduced to the 100,000th.

1236. Do you suppose there is some other process different from the photo-zincographic process we use which will enable us to produce a finer map on the 1-inch scale?—It is obvious there must be. To put the new 1-inch zincograph before the public in this scientific age as a respectable map of the United Kingdom is a very strong thing to do.

1237. Now show us a continental map which you would compare this with?—That is too large a scale; but this is on a smaller scale—this French map; that was the map which was mentioned in evidence the other day, which was commenced in 1876, and is now, I think, completed.

1238. Can we not get some evidence as to what they do—the process—there?—That is what I should like to know myself.

1239. Could you put us on the track to find that out?—I should think Professor Kiepert at Brussels, who is a great authority, would know.

1240. Is he at the head of the department there?—He is at the head of the Belgian Geographical Service. That is the 1/50,000; that is nearer our 1-inch scale than anything—that portion of the Swiss map. That is a contoured map; compare that with ours, there is such a lack of definition about our zincograph map.

1241. (*Chairman.*) I think you had better now criticise the 1-inch engraved map?—That is what I was proposing to do. I wanted to establish the point first, sir, that we had no really good map of the greater portion of the kingdom at the present moment; that the old hill-engraved map is now entirely obsolete. This (*producing sheet 47, 1-inch, old series*) is the sort of thing the public gets; we have to be careful not to take the best specimens that can be found, but go to the agents and buy a map which ordinarily comes into the hands of the public. That is a specimen of the Essex sheet. If one wants a hill map of Essex that is about what one gets.

1242. I am rather startled; I did not know Essex was a mountainous county?—It is completely worn out; you cannot trace the roads on that in many places; there is no marginal information given on that sheet at all. "Electrotype 1879 railways inserted to 1882;"

Mr.
H. T. Crook,
C.E.

18 May 1892.

See Wilson,
p. 220.

Mr.
H. T. Crook,
C.E.
18 May 1892.

but there is no further information. That is the only map that is available for tourists or even for military men in Essex. It is rather the county which is supposed to be open to invasion. Then here we have mounted together some sheets which show the junction between what is called the new series and the old. This I showed at Leeds. You can see the difference at once; the two lower ones belong to the old series which were drawn upon the scale upon which they are engraved, and the two upper sheets were reduced from the cadastral map of Yorkshire from the old 6-inch, not the 25-inch cadastral. They are fairly clear in the definition of the hills, but of course they are very backward in the want of revision and anything of that kind.

1243. (Sir A. Giekie.) The hills are not changed at all?—Oh, no, the hills are all right; but as regards road and detail of that kind, and the towns and the opening up of new districts, there is no indication of that; but even the new series is made from maps which were made in the forties.

1244. (Chairman.) And when was that made?—The two lower sheets of this map must have been made in 1830.

1245. And they do not agree in shade now?—No, they do not agree. This is a case I drew attention to. Anyone coming to Leeds and wanting a map of the district round Leeds for walking purpose, or for any other purposes, or wanting to know anything of the neighbourhood, that is all the Ordnance Survey can do for him; he has to get two sheets of the old map, and he gets two sheets of the new series of different shape, which is of course 20 or 30 years newer, and the shading is in a very much better condition.

1246. I suppose the whole of the new series have been done from engraved plates; that is, from electrotypes copies of the engraved plates?—Originally these were all printed direct from the plate.

1247. All the new series?—All the new series, and in consequence a large portion of the new series was worn out before this electrotpe invention was adopted. Sir Charles Wilson says the worn plates ought to be re-engraved, but we shall have to wait until the completion of the whole of the south of England before we have them re-engraved. I have some sheets here, I think, that would show that.

1248. I think we understand that state of the case, Mr. Crook; but we should be very glad to hear your evidence as to whether you are satisfied with the general appearance of the new series of 1-inch maps, as they are now coming out?—Well, I do not think they give us nearly so much information as continental maps.

1249. (Mr. Mather.) Have you got here a typical specimen of our 1-inch map, the best we can do I mean, the recent issue, the modern issue?—We have not got the recent issues.

1250. Is that a typical specimen of what we are doing for the whole of the country?—That is outlined merely; it is not engraved.

1251. (Chairman.) That is engraved?—Not hill-engraved.

1252. No, they have very few of them; the hill engraving has not gone very far?—There are some of the south of England, all about Reigate and Aldershot.

1253. (Mr. Mather.) Take that map of Cambridgeshire to begin with as the ground for the other?—This sheet is a particularly flat country; here of course the absence of contour lines is more marked than almost anywhere else.

1254. (Chairman.) There are no contour lines on that map?—Oh, yes, it is contoured.

1255. (Mr. Mather.) Hardly any?—They are so far apart. That was the point I was dwelling on in the 6-inch. If you had them on the 6-inch you could use them on the 1-inch. If you had the 25-foot contours you would have a better idea of the ground round about Cambridge than you do by this map.

1256. What is your opinion of that map; where is it incomplete?—It is incomplete in that it has not sufficient contours on it for an outline map, and it is incomplete in other ways. I think the roads should have been shown in colour. It is a great advantage to the public to print maps in colours after the manner adopted abroad so much, so as to keep quite distinct anything that has got to do with the ground. To adopt

certain colours for certain things, for the buildings, say red, and for the water blue. This map is very confused; it takes a good deal of looking at to make out the river cuts, of which there are a great number in a low country like this; even to distinguish them from roads and railways in some cases is difficult. It is not clear on that map, as it is in the French map, where the water is.

1257. (Lieut.-Gen. Cooke.) You would print all the water in blue?—I should strongly advocate that in all maps of a scale of one inch to the mile or less that the water be printed in blue.

1258. Then how about the roads?—Leave them in black or put them in red.

1259. They show three kinds of roads?—Three kinds of roads.

1260. The turnpike, the ordinary metalled, and the minor roads, are they not?—They are not sufficiently distinct, I think.

1261-2. The minor road is very clearly distinguished, because it has not got a thick side, from the ordinary turnpike?—It is very difficult to distinguish the two.

1263. (Mr. Mather.) Is this a typical map (producing a 1-inch hill-shaded map)?—It is a typical hill-shaded map.

1264. You would like one for the entire country like that?—I should like that improved.

1265. In what respect?—Before we get that map the time will be so long that the original sheets of it will be out of date.

1266. Supposing we have the revision going on all the time, is this the style in which you think our topographical map ought to be published?—No, I think not.

1267. In what respect?—Because it is only printed in one colour.

1268. You would adopt the French and Swiss method of making all water in blue?—All the water in blue, and I should adopt some tint for the hill-shading. I should like to see a really good national map.

1269. (Chairman.) Take this map of Brighton; we all know Brighton more or less?—This is a combination, I should think. I suggested that these combination maps should be published, and this was published the other day; it is the only one yet on sale to the public. This is an outline map, and has contours on, but I think it is apparent to anybody that they do not give a true rendering of the ground; it has insufficient contours.

1270. The contouring is inadequate?—It is inadequate to give a proper rendering of the ground, and then they are so faint that they do not stand out. If they were printed in colours, it would be better, even if there was no addition to the number of contours, if these contours already on the map were printed distinctly on the map, it would make it considerably more valuable.

1271. (Mr. Roby.) But if you had the water in blue and the contours in some other colour, you would hardly have any other room for use of colours, would you?—You see you have these colours here in that map (the French vicinal map).

1272. (Chairman.) Do you like that map, Mr. Crook?—I think it is one of the most beautiful maps that has ever been produced. The only objection to it is that these washes are a little irregular sometimes; still they are very clear. I brought this sheet on purpose because I know the ground; it is the French vicinal map. Of course it is on a very small scale, that has to be borne in mind. There is another sheet of the same map here. That is (referring to Swiss map 1:50,000), that is nearer to our 1-inch; that is a beautiful map.

1273. (Mr. Mather.) Do you know how they print these in several colours?—No, that is one of the processes I should like to see done. I do not know how these colours are got.

1274. (Chairman.) The contour lines on our 1-inch being in black, do you not think they tend to confuse the map for ordinary map purposes?—Very much indeed.

1275. And that difficulty would entirely disappear if the contour lines were printed in colour?—I think it would, quite. You see the contours on the Swiss

maps are drawn very much broader, and I think they should be broad.

1276. If they were printed in colour they would bear being treated more broadly?—Distinctly so, and in this sheet the contour lines are equally broader; they are much broader than in our maps.

1277. (*Sir A. Geikie.*) Supposing you have these contour lines put in in colour, do you not think it would interfere with the map for colouring purposes afterwards?—I do not. The Swiss one is a very light brown. There is no reason why we should not print an outline map for administrative purposes like that parish map. The photo-zincographic edition of the one-inch is good enough for administrative purposes, where you want a map of town or ward boundaries, poor-law unions, and so on.

1278. (*Chairman.*) Well, passing from the contour lines, will you take that map in your hand and say is that satisfactory as regards hill-shading?—I know this is very recent; I used a part of this at Folkestone.

1279. It is a map of Brighton—a map of Folkestone?—That is very good work for hill-shading; if you want hill-shading alone; but the point I am anxious to urge is, that we want a map which will be useful for the general public. The first thing to consider when you are going to make a national map is for what purpose you are going to make it, and whether you will require one or two or three different series.

1280. Would you produce two or three maps, a skeleton map, a contoured map, and a hill-shaded map, or would you only have one?—I think I would only have one general map. I do not see the necessity of more than one complete general map.

1281. Which map do you have?—I have already said that I would have first the outline map which might be printed by some cheap process as has been adopted now in this advanced edition by photo-zincography, and that would be perfectly useful for all those administrative purposes for which the Director-General tells us they are so largely used.

1282. Then you are in favour of two maps?—At least two in that sense. You may run off any number of copies of the outline map before you have hill-shading; but for the great topographical map of the country, for military or tourist's purposes, or for geographical educational purposes, there should be an accurate map that will show the whole topography, both the natural topography, the ground forms, the river systems, and the woods, whether the country is open or close, and also the artificial topography, the roads, railways, buildings, &c.

1283. What I want to get from you is this; it is quite agreed that we want such a map. Would you prefer to have that map as a hill-shaded map, or a contoured map?—I do not think our one-inch map satisfies all the conditions nearly as well as the continental maps do.

1284. Would you prefer to have a contoured map to a hill-shaded map?—Unless the hill-shaded map can be produced more rapidly; we shall be a long time getting this map completed.

1285. Apart from considerations of time, what kind of map would you require for general purposes; do you wish your map to have hill-shading—not yours particularly—but the map for the general public?—I think the ideal map for the general public would be much more like that Swiss map.

1286. You would have a contoured map?—I should advocate, first of all, that all the river systems should be shown in blue.

1287. That is rather another point. I am trying to get whether you would have a contoured map, or whether you would have a hill-shaded map?—I do not see why we should not have both.

1288. You would have both?—I should have both, if I had the choice.

1289. (*Mr. Roby.*) Both on the same map?—Not on the same map.

1290. (*Sir A. Geikie.*) Does that mean that you would have three?—I do not see why we should not have three; the French have more.

1291. You started with one?—The outline map is only the basis upon which you are to construct your map; it is the half-finished map.

1292. (*Chairman.*) How would you publish?—I would publish in stages the same as the French do.

1293. It is quite clear you must have a survey which would give you an outline in the first instance; would you publish that map in its bare detail?—Certainly.

1294. Then you want something further; you want to show the forms of the ground, and the forms of the ground can be shown in two ways, either by contouring or by hill-shading?—Or by a combination of both.

1295. Or by a combination of both?—Yes, what our Ordnance Survey now pretends to do. This is Reigate; all these sheets of the new 1-inch hill map are contoured also, but the contours are utterly useless on this map.

1296. On a hill-shaded map you say contours are useless?—No, they are not useless if they were properly put on.

1297. If they were put on in colour?—If they were put on in colour or put on so that you could see them, they would be useful. If you want to know your exact level, hill-shading does not give it you; it is put on roughly to a theory of shading certainly.

1298. (*Lieut.-Gen. Cooke.*) You get the higher points, I think?—You get the higher points. There the map is contoured as well, you get the contours; but on a slope of 15 or 20 degrees you could not tell your actual level above the sea; the contour lines should give you that, but they are so finely traced that it is impossible to see.

1299. (*Mr. Mather.*) You prefer this hill-shading and the contour lines in colour?—Yes, I should.

1300. Then you would have both?—I would have both. And this other suggestion I venture to make, that sufficient contours might be made on the 6-inch map, so that when reduced to the 1-inch it would give a complete illustration of the ground like this Belgian map. The chief objection to that map is, that it has been printed too much in one colour. The distinction in colour between the red buildings and the reddish-brown of the contours is not sufficiently great.

1301. That contouring is equal to our hill-shading almost, so far as graphic rendering is concerned?—That is the field of Waterloo.

1302. (*Chairman.*) It is a pretty flat country then?—It is. They have produced this one on the 40,000th, the 80,000th, and the 160,000th.

1303. (*Lieut.-Gen. Cooke.*) Exactly the same?—I am quite aware of the difference in scale, but you can render ground if the contours are close enough. If we had enough contours on the 1-inch map we should have a fairly good rendering of the ground. These contours on this map are at only one metre interval, that is the reason it gives you such a deep impression of shade, and I think it is rather overdone. I should much rather advocate the German system, where they drop the contours where they are unnecessary, or rather interpolate contours when necessary to define a feature which would be missed with the ordinary interval.

1304. (*Chairman.*) You say that map is produced on the 1/80,000 scale?—Yes, and 1/40,000 as well. Well, then you have that sheet I brought of the Norwegian map, where there is another combination of hill-shading and contouring. There is not the expensive and slow process of hachuring, but there is a shade of colour put on which answers the same purpose, and which is not nearly the same expense as hachuring, and does not require the same education of the draughtsman, which seems to me the standing difficulty with regard to the production of our hill-shaded map of England.

1305. You would suggest then that contouring in the way in which this Norwegian map is done, which is contouring coupled with the shade of colour, is as good as the most expensive hill-shading?—A number of our contours would be instrumental, and therefore, these interpolated ones would be proportionately more accurate than they are on that Norwegian map. The best thing is to thresh the question thoroughly out; and then when once a decision has been come to as to the style in which you are to produce the general topographical map of the United Kingdom, go on and finish it in 10 or 12 years, like the French have done with the vicinal map.

1306. (*Mr. Mather.*) What is your ideal map which is to be finished in 10 or 12 years from now to satisfy everybody?—The Chairman has been pressing me about this hill-engraving, and although I should like hill-engraving it is obviously impossible to do that of

Mr.
H. T. Crook,
C.E.
18 May 1892.

Mr.
H. T. Crook,
C.E.
18 May 1892.

the United Kingdom, to make up the arrears and re-survey Westmoreland and North-west Lancashire, and have them done within a reasonable time.

1307. Do you mean to have the instrumental contours shown as they are on our best—that is our engraved—map now, and coloured?—Yes, plenty of contour lines in colours.

1308. And let that suffice as our national map?—With a wash of sepia or other tint to throw up the ground forms.

1309. In addition to the contours you would trace along the contours in colours something to show up the elevations of the ground?—The Minister of the Interior in France has produced one on the $\frac{1}{250,000}$ scale in very much the same style as that vicinal map; it is of the district round Paris, about 10 miles radius round.

1310. (*Chairman.*) The vicinal map is that map in several colours?—The vicinal map is in several colours.

1311. (*Mr. Mather.*) Our contours are of course more valuable than in these continental maps, because they are almost exclusively from instrumental observation?—But I think many of the continental maps are from instrumental observation also, not the whole of each contour levelled continuously after the Ordnance Survey fashion, but still instrumental. The Swiss one is constructed, I believe, very much in the way that military contouring is done, that is by sections down the hill sides, on the flattest portion and the steepest portion on all the projections and all the recesses on the sides of valleys, and then the contours are swept in by the eye between those points; in that way you get a good rendering of the ground, and it is sufficiently accurate for all ordinary purposes, sufficiently accurate for a topographical map. There is one thing I should like to mention, and that is, the enormous difference in the area on a scale of $\frac{1}{2}$ of an inch to the mile and our 1-inch. The comparison of lineal measurement does not show the real difference. Our inch map has $2\frac{1}{2}$ times the area to render the same things.

1312. (*Chairman.*) Now with regard to the names on our maps, have you any criticism as to the adequacy of the names on the 1-inch map?—Yes, I do not think they are very fully given.

1313. Are they given as fully as on the old 1-inch map?—I think not.

1314. Do you think the old 1-inch map was crowded?—It was, I think, very, with names, but it was not so crowded with information. For instance, on our 1-inch map we have never shown what the French show. I brought this little bit of map, I mentioned it to you the other day, of the South of England $\frac{1}{500,000}$ a very small scale, but that shows the South of England; that French map shows whether railways are double roads or single roads by the way in which they are rendered, a thing our Ordnance Survey has never done; it is a thing which I think we might adopt very well on the 1-inch map. For minor roads and footpaths there is no distinction at present made between a footpath and a road on our 1-inch and smaller maps.

1315. (*Sir A. Geikie.*) On the new 1-inch map footpaths are shown by a single dotted line?—That is a change for the worse; it is so very confusing; they are so liable to be mixed up with the boundaries.

1316. Now, I think if you look at that Ordnance map you will see it is sufficiently distinct there?—I do not think so. The Ordnance Survey produces a thing now and says, "that is what the public gets," but I think we are bound to judge the Survey by what they have done up to the present moment. There are several suggestions I have thrown out during the last few years which have been adopted. We must remember that every change produces a difference in the style of of map. The thing I am contending for is that when a certain thing has been decided upon it should be adhered to, and every map kept uniform, and not changed between the issue of one sheet and another. For instance, in this one of Barnstaple in the new edition, I cannot find anything except double lines for footpaths. This is quite new; this sheet was only published this year.

1317. (*Chairman.*) Now here are the footpaths in the Gloucestershire map, shown by a dotted line; that I know to be a footpath, across the river?—Oh, yes, that one is distinct.

1318. That is a footpath?—It is very like a boundary, you are getting into another system of dots.

1319. That is a parish boundary?—Yes, there are the contours also dotted; you have three systems of dots on a very small-scale map. General Cooke was asking me just now, about the closeness of our country. This new map of Germany from which their $\frac{1}{100,000}$ th map is reduced, this $\frac{1}{250,000}$ shows every little hole in the ground, everything that would hide a man, every portion of the ground. If you study that map a little, and learn to read it, there is not a single fold in the ground that would hide a man which is not shown. Whenever the ground does not require them the contours are dropped they interpolate contours when they are required, that is the special indication there.

1320. (*Mr. Mather.*) This map you see is not contoured in colour?—No. These are 20 metres, these are fives. And then you can throw any number in. Again, here is a very minor little knoll, you might hide perhaps a company of troops behind it; they have put it in there, and put the two contours to indicate the exact depth of the ground; I suppose it is about 6 feet deep between these two points.

1321. They have very few places mapped?—Oh, yes, everything is shown on the map, on this scale; every enclosure is shown on that map; it is not an inclosed country. General Cooke was asking me about close and open country on a scale of this kind, they can show on a $\frac{1}{25,000}$ th abroad, as much as we can show on our $\frac{1}{10,560}$, that is, our 6-inch map. It requires in England about twice the scale to show all these villages and towns, and inclosures in their natural shape and natural proportionate size.

1322. Because of our inclosed land?—Because of our inclosed land, but the point General Cooke raised just now about the inclosed nature of the land does not affect the small maps, because the detail of the closeness is not shown on small scales.

1322a. This is a military map?—It is a military map of course, in one sense, but it is also a general map they are producing of the whole German Empire; they are working away at it now.

1323. Is this map quite a modern production?—Quite modern, it was commenced since the Franco-German war, it is only making now; you see they get everything on that map. On the smaller scale maps which they produce from it, they have only to leave out such information as they do not think necessary on a smaller scale map, which is rather what I advocate in the case of a 6-inch; if the 6-inch rendered the ground forms perfectly you would have everything then; you could reproduce as much or as little of it as you wished on the smaller scale.

1324. But you could not produce it by photo-zincography?—I think not, that is what I want to get at, what is the process by which these beautiful details are produced.

1325. Could you ascertain from any of your correspondents?—I will try and do so. General Cooke put a question to me just now about the close and open nature of England and Continental countries on a map of the same scale. I have already pointed out that the French and many other countries produce their general map of their country on a scale which is very considerably less, and gives them less surface to work upon than our 1-inch; that is to say, their $\frac{1}{100,000}$ th scale is very much smaller than our $\frac{1}{63,000}$ th, which is the 1-inch map; the 1-inch map gives two and a half times the area for detail; we ought to be able to show a great deal more detail. We do not distinguish between roads, we do not show roads, ground forms, population of villages, as that French map does. Every village containing more than 100 inhabitants has its place on the map. It shows every post office and telegraph office throughout the kingdom, in addition to other information conveyed by the map, and that is shown in this very small area. The Ordnance Survey raised the point, that England differs so much from Continental nations, and you have such a tremendously close country that this detail cannot be shown on that scale. On a topographical map you do not put on fences or divisions of private property, and there really is no more closeness in England than abroad. It strikes everybody going abroad how open the country appears; it is only open from the absence of fences; they do not divide their property by strong high fences as we do. On the 1-inch map, or scales thereabout that information is not shown.

1326. (*Chairman.*) Woods are not shown except in that vicinal map?—You would not see in the new one inch survey, that hill-shaded portion that you had on the table of Folkestone and neighbourhood, you would not see at a glance where the wooded country was, not nearly so well as you would on the original 1-inch map. The original 1-inch map did show wooded country, because it was a military map, and the woods were of great importance, and the woods of Surrey, Essex, and Kent could be seen at a glance; whereas they are not nearly so clear on the new. To return to that combination map of Brighton and district of which we were talking this morning. Here, in the neighbourhood of Newhaven, the contours are gone entirely; they are all omitted for a $2\frac{1}{2}$ -mile radius round Newhaven, utterly destroying the map's pretension to represent the ground.

1327. (*Lieut.-Gen. Cooke.*) That is for War Department purposes?—It is very foolish. People defending the country should know the ground. In Germany you can buy maps of garrison towns, and if one nation more than another is close in military secrets it is Germany, and yet you can buy in Metz a contoured map, 3 or 4 metres intervals, of the whole district round Metz. You can buy a contoured map of most German towns in a handy form.

1328. A fortified town?—Yes, Metz; this map I bought at Metz. It is a contoured map.

1329. That gives the contours right round, does it?—It gives the contours right round, but not the forts. The French vicinal map shows the forts. No one would ask the Ordnance Survey to put on new batteries.

1330. (*Mr. Roby.*) Is this a French map or a German map?—That is a German map.

1331. (*Lieut.-Gen. Cooke.*) We had an enormous amount of trouble doing it, taking all the contours out?—It seems a very foolish thing, indeed it seems childish folly leaving contours out in places like Newhaven; any military man could fill in those contours with a few hours' work quite easily. I have tried a little bit of military sketching myself. I could put in the missing contours sufficiently accurately for all military purposes in, perhaps, an hour or two.

1332. (*Chairman.*) You say the distinction of the roads on our English map is not adequate, that is one of the faults you find with the engraving?—I do not think the character of the roads is clear enough on the face of the map; it professes to describe three classes of roads, but unless you are well acquainted with them you cannot distinguish the one from the other.

1333. The character is not sufficiently distinguished?—The character is not sufficiently distinguished.

1334. And the woods round are not so clear as on the old 1-inch map?—No; and that is important, being a military feature.

1335. It is deficient in names as compared with the old 1-inch map?—I think it is; that is the general impression I have gathered from the use of it.

1336. Have you noticed whether there was any difference between one part of England and another part of England that has been published on the new scale as to dropping out names?—No, I cannot say I have noticed any marked difference. I think all the important names are given, it is more names of very small places, or single dwellings, single houses, or mansions, or parks that are omitted. I notice a difference between the old hill-shaded map of the north coast of Wales in names, but it is not of any material importance.

1337. Well, you think there are enough names put on?—I think there are.

1338. You will not criticise the map from that point of view?—I think if you try to do too much, you probably will spoil your map; there are much more essential things which are left out which I should like to see shown in preference to more names.

1339. (*Mr. Roby.*) I was going to say about the English map, have you not some remarks to make with regard to some very small portions of the country being left occupying a whole of the sheet?—That I think I have already dealt with on the 6-inch.

1340. No, but I am speaking of the 1-inch; for instance, the map of the coast of Devon where Bude has only a little bit appearing about the edge?—Very often there is a little bit cut off in arranging sheet lines; if you take the index of the maps you will see it,

a little bit or corner runs out and you have to buy another sheet for that little bit; in nearly all the continental maps they would put it in, and not only would they put it in on the coast-line but they would put the other portion of a town or a bend in a river, a turn of a road, a curve of a railway, or other important detail out by the sheet line. It is done on the French vicinal map. The latitude or longitude is kept a little way outside the sheet lines. Any important features of that sort you get completed on the French map without getting another sheet. On the coast-line, where it runs out like at Bude, you should show that small portion. They do it on the same principle on the Swiss map; if you wanted to have that railway shown you would have to buy the sheet above on the English map. By the French and Swiss method you could correct any little error on the sheets if the sheets are not the same size or anything of that sort. For instance, I think there is one sheet of the inch map which you have on the table here. This is a case in point. Here you have to buy this sheet, you see, for that little bit, about an inch and a half. I think that could quite well have been shown on the adjoining sheet without the trouble of having to buy a separate sheet for that little bit.

1341. (*Mr. Roby.*) The margins would sometimes admit of these additions?—Oh, yes, they would on our old 1-inch maps. You will find Beachy Head on sheet 5, I think, of the old map; it goes below the margin of the sheet; it was not worth while making another for Beachy Head, so the margin is broken and the Head is shown.

1342. With regard to this French map of the south of England, which you have brought forward in order to put the character of the map on the notes, would it be right to say that all water and the names of water are printed in blue?—Yes.

1343. That the hills are denoted by shading in colour?—Yes, a sort of brown I should call that.

1344. Then there is some green; what is that?—That is wooded country; it is a very small scale; it is merely denoted where it is wooded by a wash of green.

1345. And the lines are denoted by the one single line or two double lines?—The principal roads by a double line in the usual fashion, and the minor roads by a single black line; the scale is 1/500,000.

1346. About 8 miles to the inch?—Yes.

1347. With regard to the vicinal map of France, which you have spoken of, how would you describe the use of colour in that map; again is water in blue?—You have it all here. Here is the official description of it, which I think is perfectly correct. That was the state of publication in 1885 when I got that index. You see the immense number of notes and explanatory references in these maps.

1348. (*Chairman.*) When did this map begin, do you know?—It began in 1876, I think, sir, as far as my knowledge goes, I think it was 1876 or 1877 that I first heard of it. I think I got that index which shows its state in 1885.

1349. It seems to be noted here that a very considerable part of it has already been re-published; do not know whether they mean by that revised?—It is revised every five years, or re-edited, as they call it.

1350. I think Mr. Crook, in connexion with his evidence, might say that he produced the index to the French map which commenced in 1876?—I believe so.

1351. Or about 1876?—I know it was some years after the war; it was when the French nation were beginning to recover from the effects of the war that they undertook this work.

1352. From which it appears that about one-half of France was already published in 1885?—It was published in 1887.

1353. I do not think the index says that; I thought it was 1885; it was published in 1887, and one quarter of that had already been revised?—Yes.

1354. (*Mr. Mather.*) They began revision probably as soon as ever they had completed a portion of the country; they had another staff revising following on?—I think that is it.

1355. (*Chairman.*) But a large part of this is published, as yet, only as a skeleton map, or was, at that date, only a skeleton?—I think there was close on to 25 per cent. of the entire area in 1887.

Mr.
H. T. Crook,
C.E.

18 May 1892.

Mr.
H. T. Crook,
C.E.

18 May 1892.

1356. Well, I was guessing that that was about one-half; that one-half was published?—Yes, about one-half was published.

1357. About one-half was published and about one quarter of that half is in outline?—Yes.

1358. And about one quarter of it has been actually revised?—Yes, 25 per cent; that was at the date of that index.

1359. (Mr. Primrose.) Do you know whether that map was redced from an earlier survey?—Of course the triangulation and the main points have been determined from the other surveys no doubt, from the earlier surveys.

1360. Have they a special re-survey for this map?—Oh, yes; this is nearly all put in by plane table work. There is one point about the publication of a portion of it without the hills; it refers only to hill-shading; all the rest of the information on this map is published, all the horizontal development of the ground appeared, and everything else; it is merely this hill-shading that is absent from the earlier edition.

1361. (Chairman.) Without hill-shading?—The hill-shading is only a very small element. There is an immense amount of information; all that is given, about the population and so on. It is only the ground forms that are not given in the earlier edition. You see there is no necessity to buy a sheet of characteristics to understand that map; you see it is all there, in every detail.

1362. Have you any other points that you would want to take up?—Well, I wanted to go into the question of indices and the price of the maps. I think it is one of the defects of the surveys that we do not get sufficient information about the maps, and the index question is, I think, a very important one from the public point of view. How to get at our maps has

been always the difficulty. Of course the question of index is not the question of agency.

1363. (Mr. Mather.) And the question of price, have you dealt with that?—I have not dealt with that.

1364. Have you anything to say of the $\frac{1}{4}$ -inch map?—I should like to say something about the $\frac{1}{4}$ -inch map. It is a question whether the State should go in for the smaller maps. It has always been an open question, and the Ordnance Survey has repeatedly stated—the Director-General has repeatedly stated—that it has not been considered the work of the Ordnance Survey. Still, at the same time, they have on the list of maps, authorised, two maps on smaller scales than 1 inch to the mile. They seem to be a portion of our national work, yet the Survey officers say they are not instructed to make small-scale maps. I think it is rather an important question, especially from the public point of view. This map we have been looking at—this French 500,000th map—we have nothing like it in this country. The Survey produced a 250,000th-scale map the other day; a most extraordinary map.

1365. Published in France of England?—Yes, of the parts important to them.

1366. (Chairman.) Stanford would say he has as good a map of England as that on sale?—Stanford could not produce it. The basis of all publishers' maps is the Ordnance Survey; it is essential that they should have a tolerably perfect national survey on which to base their small publications.

1367. As to a smaller map than that you would really get all the necessary details on the old 1-inch?—Yes, but there is additional information on the French map which is not on our 1-inch.

1368. That Mr. Stanford would obtain for himself?—Yes, in the same way as the French obtain it for themselves.

The witness withdrew.

Adjourned till 19th May at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

FIFTH DAY.

Thursday, 19th May, 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.C.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE, M.P.
Major DUNCAN A. JOHNSTON, R.E., Secretary.

Mr.
H. T. Crook,
C.E.

19 May 1892.

1369. (Chairman.) I think we are going to talk about the indices first of all?—Well, sir, I put some notes down to bring in order, and after finishing the maps, I will come to the indices, with your permission.

1370. Very well?—There are the other small-scale maps to finish. I had to go to Mr. Stanford's yesterday for some order of my own that I wanted carried out there, and while I was there these maps came in of your own seat of government, the city of Gloucester. I asked Mr. Stanford to let me bring them over to show you the difficulties which arise from the changes in the style of production.

1371. That is the 6-inch map?—Four quarter-sheets of the 6-inch map; you see the differences not only in the paper out in the style of map. It is impossible to make a satisfactory map of four such sheets. The S.E. sheet is one of the yellow sheets without contours. The buildings are entirely black on the two upper sheets, cross-hatched on the two lower sheets. With regard to the sheets without contours, I think I gave in evidence

before, that the public has to consume these advanced copies without contours before they get the others.

1372. (Lieut.-Gen. Cooke.) Is it stated on the map that it is published without contours?—Oh, yes; it is stated on the map. Mr. Stanford will now apply for the contoured map to make this up; but I do not think the customer who returned these maps raised the question of contours at all. What he raised was the difference of the city of Gloucester itself and the paper of the S.E. sheet.

1373. (Chairman.) This sheet is an old one, first edition without contours. This is a contoured edition on white paper with buildings cross-hatched, and the two others contoured editions with buildings in solid black?—It is the different mode of rendering the town and buildings.

1374. (Sir A. Geikie.) What is the date of that?—One is 1888 and the other is 1889. It would not make a pretty map mounted.

See Wilson,
p. 221.

1375. (*Chairman.*) They have changed the mode of doing the town?—Yes, the Survey never knows its own mind. It is always experimenting at the expense of the public. Cross-hatching was the original style of rendering towns on the 6-inch map, and then the solid black style is adopted, and now apparently cross-hatching is being reverted to.

1376. Mr. Crook produces four contiguous maps about Gloucester, one the old edition on yellow paper. The three others belong to the new edition, one of which has the buildings in the town cross-hatched, and the two others the buildings in the town in black, so that they would not join?—They would join, sir.

1377. They would not harmonize?—They would not harmonize.

1378. (*Mr. Mather.*) And these four maps were offered to the public at Mr. Stanford's, and were returned by a customer as being useless. I think it most important to put that on record?—And there is the consequent delay, you see, in these matters.

1379. But that is the fact that these were supplied by Mr. Stanford, the agent for maps, to the public as suitable to the request made?—Yes; you see too that in the S.E. sheet, which is on yellow paper, even if it were printed with contours and on the same paper as the others, the buildings would still be in black, so there would be two black sheets and two cross-hatched sheets.

1380. (*Chairman.*) You may take that sheet on the yellow paper as being an out-of-date edition?—That would not make any difference to the buildings.

1381. I suppose the new ones that are produced are hatched?—No, sir. The buildings, if they are already in black, could not be changed very well without a new plate.

1382. You think that is irreparable?—As long as that plate is used they will be in black.

I should like to draw the attention of the Committee to the new 6-inch sheets. I believe there are a few published. I think Sir Charles Wilson produced one or two the other day of Yorkshire, the new photo-zincographic quarter sheets. I should like the Committee to see a photo-zincographic quarter sheet of Yorkshire, if there is one to be obtained; with the 25-feet contours on it. You see in Lancashire and Yorkshire we have 25-feet contours. We are now going to have a photo-zincographic reproduction of our cadastral survey, and I should like to see it with the 25-feet contours on. There was only a very small section published, according to the annual report. (*Some sheets of Yorkshire were produced and examined by the Committee and the witness.*)

1383. (*Mr. Roby.*) In making the plates changes do take place?—This is a change for the worse.

1384. Worse from your point of view?—It is worse from a public point of view, because it brings about an inconsistency between the two sheets of the map.

1385. (*Chairman.*) You do not object to the style or character of the contoured lines?—I think it is very bad indeed on these new maps.

1386. It is a different character to the old one?—The old style was very much better. On the old maps there is a distinction between interpolated and instrumental contours. The few contours that are now given are all instrumental, I believe, but the character of line is nearly the same as that used formerly for interpolated contours. Another quite unnecessary difference has thus been introduced. If the interpolated contours be re-introduced, as they should be, the whole of the instrumental contours on the later 6-inch maps will have to be re-drawn. The old style of instrumental contour also had the advantage that the points where levels were actually taken were marked.

1387. Now, Mr. Crook, we will go on with the small-scale maps?—There was another point which I did not mention yesterday. You were asking me, sir, about the value of contours beyond their engineering value. They are most valuable in estimating the value of ground. For instance, you see at once the nature of the slopes, and therefore, of course, its agricultural value which is materially affected by the slopes. I remember in the Rathmines Waterworks, in the Dublin Hills, on which I was resident engineer, we had a very long fight in the courts there in buying the land. They made us pay, and the valuers agreed to it, for the area on the slope, because they said that was the man's land we were taking, not the horizontal development of that area—not the map area. By the

order of the arbitrator the lands were specially surveyed on the slope in order to get at the acreage. We were to pay for it by the acre, and of course the value of the ground was materially diminished by being on a steep side.

1388. I should not have thought that any arbitrator would have said that?—They said, "Sure it is the man's land your taking." That was the way they argued. Any man capable of acting as an arbitrator in a dispute as to the value of land, and sitting as an arbitrator would see that land on an exceedingly steep slope must necessarily be of less value than that on the bottom and the top.

1389. (*Mr. Roby.*) The more you increase the area on the steep slope the more you would diminish the value. The sloping ground is not so valuable per acre as the horizontal ground?—And there would be less acreage to pay for.

1390. (*Chairman.*) There can be no acreage except the horizontal acreage?—Except the horizontal acreage.

1391. There is no question that there can be no acreage except the horizontal acreage, and any man who laid down any proposition to the contrary would be laughed out of court?—What I wanted to point out was that any arbitrator would see, if the contours were on the map—the slope of the land—would be able to see that it was not so valuable.

1392. I understand this arbitrator said the sloping surface was the real surface?—Yes, he did; but what I want to bring out is, that the contours are valuable as showing the value of the ground.

1393. Well, we have dealt with the contours; let us go on now with the small-scale maps?—I do not know whether you have had the one, or two experimental maps of England on the 1-inch scale, on which the contours were printed in red.

1394. I have seen them?—You have seen those.

1395. That affects the question of colouring contours?—The water was in blue and the contours were in red. You were asking me yesterday as to how it should be done. Then there are more differences again in the maps. Some people will not have the maps because a further improvement has taken place in putting on the coast contours below the water; the contours of the sea bottom, and that further improvement again makes differences in the maps. For example, the sheet of Bude, which Mr. Roby was referring to the other day. The northern sheet of Bude has the contours of the sea bottom on it. It is a very valuable addition to the map; the sheet below has no submarine contours.

1396. In consequence of the changes in the mode of work maps do not harmonise?—They do not harmonise, and these constant changes and differences interfere, of course, with the sale of the maps. Customers do not understand them; they send them back and will not have them. Some of these changes seem to have been made without considering their effect at all. You also asked me if I could mention a particular hill-shaded sheet which was done from a contoured map. I produce sheet 50, new series. It is a remarkably good specimen. I think that is one of the most perfect sheets that the Ordnance Survey ever produced, and the hill-shading, I think, could never have been done without the 25-feet contours to base it upon. I think it is about the most perfect example that I know.

1397. Please let us go on with the small-scale map, Mr. Crook?—I should like to mention, before we pass away from that, about the meridian question that I raised yesterday. I think that the system I advocate is adopted in all the United States Surveys in long north and south sections. I mean to say it would not be a new departure, because it has already been tried.

1398. Please proceed?—With regard to this 4-mile map, sir, it is No. 5 on the programme of the Survey, and it is stated that a map is to be made of the United Kingdom on the scale of 4 miles to an inch. Sir Charles Wilson rather led us to suppose that the publication of this map was accidental, but it seems to be in the instructions to the Survey under which the Survey is carrying on its work, it is to produce this 4-mile map and it has been produced of the three countries in outline, and we had a portion of it the other day with hill-shading.

1399. (*Lieut.-Gen. Cooke.*) I think what Sir Charles Wilson meant was, that its publication in its present imperfect state was accidental?—But that cannot be

Mr.
H. T. Crook,
C.E.

19 May 1892.

Sir Charles Wilson,
p. 221.

Mr.
H. T. Crook,
C.E.

19 May 1892.

See Wilson,
p. 221.

remedied, sir; it is taken from old information; it cannot be remedied now.

1400. What he meant to imply was, I think, that it would not have been published now in its imperfect state unless it had been for a particular purpose; that is what I think I understood him to mean?—But this English map is only a part of the general scheme of producing a 4-mile map of the United Kingdom, and as such it must be taken as evidence of the capacity of the Ordnance Survey to produce a map on the scale of 4 miles to the inch of the United Kingdom. It is part of the work which is intended to form part of the survey, and the Survey is under instructions to make a map of the United Kingdom. We have seen that the Irish portions are going to be finished in hill-shading, and no doubt these English sheets were intended to be shaded; but attention having been drawn to its absolute inaccuracy will, I hope, now prevent the further waste of money upon it.

1401. (*Chairman.*) We have had in evidence, you know, that the plates had been put by and were not in use, and were not intended to be used apparently, and then there was a sort of a demand and they were produced?—But you have it on the orders of the Survey that a map on the scale of 4 miles to the inch is to be produced, quite apart from its being liked by the archæologists, for whom it is no doubt interesting. I wrote to the Ordnance Survey at Southampton to ask when these two small maps, the 4-mile and 10-mile, would be ready, and Sir Charles Wilson wrote me a letter in reply, in which he said the 4-mile map is now in the hands of the engraver, and the 10-mile map has been published for some years. That was when I was writing about the survey in 1889, and I was anxious to know when these two small-scale maps which the Survey was under orders to make of the kingdom would be ready; that is, my application for a copy of this map was exactly the same as that of any archæologist or geologist. They knew a map was in preparation, and they wanted to see it and get hold of it as I did. It had been on the Survey orders since 1863.

1402. Where do you find that?—Under the existing instructions which, according to the history of the survey in the annual report, were formulated in the Treasury Minutes of 1863 following upon Lord Bury's Committee.

1403. (*Lieut.-Gen. Cooke.*) What is your exact point now?—My point is that this map is a part of the 4-mile map which the Ordnance Survey is under instructions to make of the United Kingdom, and that this map is an abomination and that it is a disgrace to the Ordnance Survey Department.

1404. (*Sir A. Geikie.*) That is your opinion?—That is my opinion and a very strong opinion, sir, that this map should never have been produced. It condemns the management and the work of the Ordnance Survey altogether, so far as the production of small-scale maps is concerned. In these days to put it forward as a map of the kingdom on 4 miles to the inch is a disgrace to any Ordnance Survey institution.

1405. (*Mr. Roby.*) Supposing there had been a note put at the bottom of the map: "This map does not profess accuracy, printed from an old survey, but is intended for a special purpose in connexion with so-and-so," would not that have altered your opinion?—It does say, "Printed from an old map."

1406. And intended for a special purpose?—No, that would not have complied with the orders.

1407. That would merely have meant that this was not the map, but they would afterwards produce a more complete map?—This was the map commenced in 1859 to carry out that order.

1408. If they had put that on, "That this is only intended for a certain special purpose," that would have been taken to mean that it was not the map intended for all purposes, but only for the particular purpose which had led at that particular time to its production?—But it is not only inaccurate, because of the ancient date of the survey. It is full of inaccuracies due to antiquity. It is also inaccurate in physical features and some of the rivers are made to run in a wrong direction.

1409. (*Chairman.*) In fact the map was out of date at the time it was published?—A river does not get out of date, sir.

1410. Oh, no; the old 1-inch map was extraordinarily inaccurate in certain parts of the country?—Maps of

this description should be subjected to some examination before they leave the office.

1411. The evidence we have is that the materials for this map were ready but were not intended to be used, and that people applied for it, and so they produced the map admitting its inaccuracy?—Not at all admitting its inaccuracy in regard to the river features, but admitting its inaccuracy with regard to the data of towns. It is incorrect in regard to the size of Blackpool and the absence of Widnes.

1412. Everybody must allow that the map is imperfect?—It is not only imperfect in that way, it is wrong in the most simple things. Any ordinary map is more correct than that with regard to south-east Lancashire.

1413. (*Mr. Mather.*) Is your contention that the Department ought not to have issued this map at all?—Certainly.

1414. As a map it must be presumably the one ordered by the Treasury to be produced on the $\frac{1}{4}$ -inch scale?—Certainly.

1415. They had no right to issue it at all?—They had no right to issue it at all, or if they had issued it as an old map, published for special purposes, not up to date, but 50 or 100 years behind time, one could have understood that. Quite apart from its antiquity, it is wrong in the river system with regard to Lancashire, where I have critically examined it, and that notwithstanding that the Ordnance Survey has in its possession the most complete evidence of the formation and shape of the ground of south-east Lancashire to its hand at the office in Southampton; a more complete history and picture of the ground than they have of any other portion of the kingdom except this county and Yorkshire.

1416. (*Mr. Roby.*) Would you define the particular portion in which you say the maps are wrong?—Well, if you do it from the old 1-inch map it is doubtful in one place, but the hill-shading helps you out; there is a stream shown there; this is the most conspicuous instance between Bolton and —

1417. (*Lieut.-Gen. Cooke.*) Could you not put the error down for us, and then we could refer it to Southampton?—I could, sir. I will give you the specific names of the brooks themselves, Borsden Brook. Borsden Brook is shown here to originate close to Hindley; you see the thickening of the line. That does not run in that way at all. Instead of running due north, as shown on this map for 4 miles, it runs due south.

1418. (*Chairman.*) It crosses the canal?—It crosses under the Bridgewater Canal as a matter of fact, but on this plan it is shown discharging into the Leeds Canal. You can get the levels from the 6-inch map, and you will find that the Borsden Brook is about 230 feet above Ordnance datum at its source as shown, and over 400 at a point 4 miles lower down.

1419. Do you think these errors are comprised in that small space, or do they run all over the map?—I could not say; there are other errors in other parts of the map.

1420. (*Mr. Roby.*) The Borsden Brook is wrong in point of direction, and it is made to run up hill?—It is made to run up hill. The river Douglas is shown to originate at Wigan, and run north, which it does not do.

1421. (*Mr. Mather.*) May we get this down as Mr. Crook's view, that the $\frac{1}{4}$ -inch map, as at present existing, ought not to have been published at all; that is what I take to be your verdict?—Certainly, even if published as an antiquated map, it ought to have been published correctly.

1422. Perhaps Sir Archibald Geikie may have found some use for this map geologically; I understand you to say, and this is the sum really of all you have said, that for public purposes this map ought never to have appeared?—Well, if there is any public use for it it might have appeared, but it should have been correctly drawn, even if obsolete.

1423. You say there is no public use for it; the special use we do not refer to, but such use as you and others—thousands like you—would have made of it?—It is the same way; it is part of the public use.

1424. (*Chairman.*) You say it ought never to have been published, and you are inclined to modify that, I understand, by saying that "unless for a special purpose"?—What I mean is, that there is no objection if you put clearly, as Mr. Roby suggested, that the map

See Wilson,
p. 221.

See Wilson,
p. 221.

is an old map, there is no objection to a map as an old map; but an incorrect map, whether it is old or whether it is new, is a different thing. This is incorrect in the drawing.

1425. Is it incorrect in the drawing?—There is no doubt about that; yes.

1426. And being incorrect, is it absolutely useless for any public purposes?—Yes, it is absolutely useless. This sheet is a portion of Ireland, part of the same 4-mile map of the kingdom, and illustrates the inconsistencies of the Survey, it is brought out in a totally different style from the English map.

1427. (*Mr. Mather.*) Is this correct?—I am not able to say. Ireland does not develop as rapidly as England.

1428. No, but the rivers do not run uphill in this map?—I have not been able to find anything of that kind in the portions of Ireland I know.

1429. (*Chairman.*) This is a much better map in style?—I do not think it is altogether, for a map of this scale the roads and railways are quite unnecessarily exaggerated; it does not distinguish as foreign maps would do whether a railway is a single or double line, and the roads cover it all over; there is a terrific mass of roads in various parts of the map.

1430. Do you think there are more roads on it than a person on an Irish car would want?—It is not the number of roads it is the mode of delineating the roads. The Ordnance Survey never can get into its head a different idea from that they have followed for a hundred years, namely, that every road shall be shown with double lines. They have no method of putting information on a map of this scale in anything like proportion.

1431. (*Mr. Mather.*) If scaled the space between two lines representing a road might be 100 feet wide?—Might be 100 yards wide. The minor roads might have been shown by a single line.

1432. There is a want of proportion, you mean?—A want of proportion.

1433. (*Chairman.*) It is the general style of maps?—It is a matter of draughtsmanship. In this map, which is quarter of an inch to the mile and therefore only 1/16th part of the 1-inch map, the roads are the same size as they are on the 1-inch map. Of course they have to be exaggerated a little on the small-scale maps, but on that map the exaggerations are out of all proportion to the scale. You see it is a different style to the English map altogether; the English map is bad enough, but you can distinguish one road from another on it. It is all part of the same scheme, and the English sheets are the worst. The Scotch sheets are also part of the scheme of the 4-mile map. The map is really a disgrace to any cartographical institution; the Scotch is a different style of sheet altogether. The map is supposed to be a handy map of the United Kingdom. The Ordnance Survey cannot adhere to one style of delineation in one year's time; all these maps have been published within 12 months, and there are three different styles for the three different countries.

1434. (*Mr. Roby.*) This Scotch sheet is a photo-zincographic, the Irish is engraved?—What I am complaining of is that every one is produced on a different system and differently drawn.

1435. On the Scotch map the rivers are all put in blue?—But so badly zincographed that they are broken. Very often they are like dotted lines instead of continuous streams.

1436. (*Chairman.*) You say this is within the last 12 months?—I think it was published in 1890. This English one was only published last March. Although it is dated 1891, it only saw the light in March last.

1437. (*Sir A. Geikie.*) But although it was only published last March, some of the sheets were surveyed perhaps 30 or 40 years ago?—In 1859 it was started. I do not think the engraving would have been started so long ago as that. I think a map of this sort could easily have been produced in 12 months and would never cost very much, with the information in the possession of the Ordnance Survey. A map up to date, and one which would not have cast such a disgrace upon them as those sheets do, might have been made, with a few months further delay, from the new surveys.

1438. (*Mr. Mather.*) Your recommendation would be that the whole of this 1/4-inch to the mile map should be withdrawn?—The whole thing should be condemned, and a new 1/4-inch map made; if it is necessary to

have a 1/4-inch to the mile map. Surely, when the Ordnance Survey starts out to make a map it has some idea of the purpose that map is going to serve, whether it is commenced in 1859 or 1879, makes very little matter, there must have been some idea of making a map for some useful purpose.

1439. Following the instructions of Lord Bury's Committee?—Following the instructions of Lord Bury's Committee, certainly.

1440. Instead of making a survey for the purpose, they used what they had by them?—They began in 1859, and went on to 1872, and then abandoned it and then took it up again, according to Sir Charles Wilson's evidence. I think that map would have been published anyway, whether the societies had asked for it or not. It is part of the 4-mile map of the kingdom and would have come out sooner or later. And you see that the Irish map we were shown the other day is being completed, and I think if it had not been for the errors which I pointed out in the English sheets, the English sheets would probably have been completed with the hill-shading. Sir Charles Wilson told me so two years ago that the intention was to issue an outline map first, and it would be followed by a 4-mile map, as they call it, hill-shaded, and that outrageous production was intended as the basis of a general summary of the work of the English Ordnance Survey.

1441. (*Sir A. Geikie.*) But did Sir Charles Wilson say to you that in a hill-shaded map he would use that same map as his basis?—No, but the outline sheets would be produced that year; they were in the hands of the engraver; that the Irish sheets had been published, the Scotch sheets had been published, and "the English" sheets will be published very shortly, being in the "hands of the engraver," and that it is the intention afterwards to add the hills, and, he says in the report here, that the 1/4-mile map of England and Wales is being done under existing instructions to the Survey.

1442. What are you quoting from?—The last report, sir, pages 3 and 4: "A map on the scale of 4 miles to the inch" is ordered. Then on page 4: "A map of England and Wales on a scale of 4 miles to an inch" has been completed in outline." That is carrying out this order which is on page 3, therefore, I maintain that that is the map which was deliberately intended by the Survey to fulfil the order under which they were directed to construct a map 4 miles to the inch, and it is the intention of the Survey to put on the map the hills some time or other.

1443. That is an inference of yours?—I think it is a fair inference from the report and instructions, sir. Of course, now, having committed such an atrocity the Survey would be very glad to withdraw it, I have no doubt. Then we must consider, also, the cost of all this work to the public; it is all money thrown away; money has been wasted and squandered over it, and the engravers kept back from the 1-inch hill-shaded map. We hear of the engraving difficulty constantly, and yet they have been occupied in producing these practically worthless sheets. Then the next map is put before the public as fulfilling the instructions to make a map on the 10-mile scale. I could not believe such a thing possible. But I wrote to Sir Charles Wilson, and asked him when the 10-mile map was going to be published, and he replied to me that the 10-mile map had been published for some years, and this is the only 10-mile map that has been published.

1444. (*Chairman.*) Is that complete of England?—It is complete of England. Of course this is simply an engraved index of the 1-inch sheets on the scale of 1/4-inch to the mile; compare that with the map you were looking at yesterday, the 1/4-inch map of France, which shows the southern counties of England. This is on a very slightly larger scale, and is an example of what a foreign Government can do of our own country. The first is the 10-mile map put before the public as fulfilling the instructions to carry out a 10-mile map of the United Kingdom, and the other is the work of a Continental Government which is dependent for its materials on our own surveys and I suppose some amount of personal observation in addition. The 10-mile map is open to the same objection as the 4-mile map, it is so very difficult to read; railways are shown so very broadly, and only in one colour. If the railways had been put on in black, and the roads in brown, or something of that sort, it would have made the map very much more readable.

1445. What has happened to the rivers here; have they gone in the right direction?—Oh, it is too small a scale to see; they are, I should think, very probably

Mr.
H. T. Crook,
C.E.

19 May 1892.

See Wilson,
p. 221.

See Wilson,
p. 221.

Mr.
H. T. Crook,
C.E.

10 May 1892.

See Wilson,
p. 221.

wrong—the particular rivers which are drawn wrongly on the 4-mile map seem to have been omitted. The large waterworks that cover nearly 3 miles of ground, they are not shown on any of these maps—Rivington Waterworks, constructed 40 years ago. The river Douglas is wrong; it rises not far from Rivington. It is marked here at the same place as the Yarrow rises; then it dies away altogether; and when it revives it gets mixed up with another one. The Douglas ought to run right up to Wigan, through Wigan, and then in a north-easterly direction coming from Rivington. It does not show it at all.

1446. It is only fit for an index map?—It is only an index map, that is all it is.

1447. (*Sir A. Geikie.*) That is all it professes to be? Well, according to the Director-General, it carries out the instructions to him to make a map of the kingdom on the scale of 10 miles to an inch.

1448. Is not "index map" printed on it?—The instructions are to make a map of the kingdom. When you want a map of the kingdom you do not want an index map. A 10-mile map might certainly have been made the basis of an index map.

1449. (*Chairman.*) Will that do for the small-scale maps, Mr. Crook; shall we go to the indices now?—Well, this, you know, is the catalogue and general index to the Ordnance Survey productions. I think one of the great defects is that there is no means for the public getting information about the maps in an easy form. This index is a mass of information of a miscellaneous character, but it is arranged without reference to position of places or anything of that sort. No one can do anything with this index; it is simply a list of maps. It is a list of the maps that can be got, but there are no diagrams or anything to show where these maps are, or their relative positions, except for the 1-inch; it gives all the parish names on the 25-inch map which are published, and says the total number of sheets are so many, and their numbers are—

1450. (*Mr. Roby.*) I suppose a person wanting to get a map of his parish would have no difficulty in finding the numbers there?—He will have great difficulty, because the name of the parish on the map does not appear on the index; that is one of the puzzles. But before I proceed to that, I want to point out that the Ordnance Survey cannot manage to draw a correct map of England for its official catalogue. The coast-line in the index to new series 1-inch is grossly inaccurate. The whole of the Lancashire coast here is wrong; the Dee and the Mersey are totally wrong, and the estuary of the Severn is totally wrong. In their own catalogue they have never discovered that the western coast-line is wrong in most important places. Anyone going to look for sheets 48 or 49 would scarcely recognise them on the official index of the Ordnance Survey, and they perpetrate that error year after year, as the catalogue is published year after year. The map we have on the table shows one of the sheets; the sheet in that corner—the north-western sheet—shows a large piece of water on it, and on the index it is all solid land. Sheet 49 is near the estuary of the Kent River, you see the two maps; curiously enough the old series index map here is right; on the small-scale map, the Severn and the Dee, and the Mersey, and the coast of Lancashire are shown approximately correctly there, but on this index of the new one, look at Preston, Southport, four or five promontories are sticking out there.

1451. (*Chairman.*) The index map published in the catalogue is not correct?—Neither as to the coast of Lancashire, Cheshire, the Dee, or the Estuary of the Severn. And strange to say, the maps in the Director-General's annual report are wrong too. Morecambe Bay is also wrong in the annual report from year to year.

1452. Let us come to the system; the right system is, I suppose, index maps?—The right system is index sheets—index maps.

1453. Like that, in fact?—That is the most graphic way of rendering an index. Supposing you have to select places in your index you ought to be able to rely upon its being reasonably correctly drawn, and that it has a reasonable number of place-names on it.

1454. That is important; the accuracy of drawing the coast is not very important?—If wrongly drawn it is misleading. People would not know what sheet they wanted.

1455. The errors do not go to that extent?—Oh, they do on this sheet 49, which is an inland sheet on the index, and is a coast-sheet in reality.

1456. (*Sir A. Geikie.*) I fail to see your point there; the part you pointed to in that corner was a tract of country which was laid bare at low water, and nobody is likely to be deceived whether you count that sea or land?—It is land on the index map, therefore a person wanting the coast sheet would be deceived.

1457. The quarter-sheet you pointed to having a great area of water on the left-hand corner?—Surely the coast is the boundary of the country.

1458. That is a very small point; you do not expect rigid accuracy in that?—I expect the Survey Department—a National Ordnance Survey—to be able to draw a better map of England than that one, of which any schoolboy would be ashamed.

1459. (*Chairman.*) You do not mean sheet 49; that is an inland sheet?—That is what I complain of. It is really coast-line, and that is what Sir A. Geikie does not see.

1460. And 48 and 38 are coast sheets, and sheet 49?—This sheet 49 at the top is a coast sheet; it is unmistakably a coast-sheet. There I think that is misleading to the public; the map is perfectly right, but the index shows the place to be high and dry land away from the coast.

1461. (*Mr. Mather.*) Your point is, that in buying sheet 49 for instance, from the index, when you have it sent home by Mr. Stanford, you would not have the map you wanted?—Most probably not, unless you were very familiar with the country.

1462. (*Chairman.*) As to the index to parish maps?—Index to parish maps. This is the index to the parish maps of Lancashire, also to the 6-inch sheets.

1463. This is the 25-inch?—And also the 6-inch sheets.

1464. The index to the 25-inch maps and the 6-inch maps is a common index, I believe?—No, not always so. Again those changes come in with different Directors-General or every time the public get up an agitation or certain individuals make a recommendation; for instance, the Ordnance Survey recently published a very beautiful index in some counties, showing the parishes, an index to the maps on the 6-inch scale—a very good index indeed.

1465. (*Mr. Brickdale.*) But if you know your parish, I think you can get a parish index map for a 1d. or 2d., can you not?—In some cases, not in all. This is a parish index, the index to the parish maps of Lancashire; that is all wrong there.

1466. (*Chairman.*) I imagine, Mr. Crook, in buying maps, you would not buy by going to that sort of index; that 4-mile index of Lancashire, showing civil parishes, is a bookseller's index?—Yes, but then they do not provide anything else. The system is bad all through.

1467. (*Lieut.-Gen. Cooke.*) This seems to be the latest of the parish indices?—Yes; that of course is important; that 4-mile civil parish index is what anyone wishing to buy a map of Lancashire would get; that portion filled in with red has been filled in by Mr. Stanford; that shows the state of publication. The Survey never show the state of publication; they rely upon the agent.

1468. This 4-mile civil parish index is an index both to the 25 and the 6-inch?—Yes; this portion, which is coloured red, is the parish of Eccles. You recollect we had the maps yesterday. It is not an inconsiderable place; the population is 26,000, and the name does not appear on this index to the parish maps; the parish of Eccles does not appear on the index map before you.

1469. (*Chairman.*) You say the index as published contains an insufficient number of names to enable people to find their own sheets?—The index contains a different series of names and different parishes to those that are published on the maps.

1470. And you say that the index is not correct as regards the names of the places.

1471. (*Mr. Mather.*) It does not correspond with the published maps?—It does not correspond with the published maps.

1472. (*Chairman.*) The sheet lines do not correspond?—The sheet lines are perfectly accurate, but the parishes—those are a different set of parishes from those which appear on the maps.

1473. (*Lieut.-Gen. Cooke.*) Civil parishes you mean?—The ecclesiastical parishes are used on the maps, and the civil on the indices.

See Wilson,
p. 221.

See Wilson,
p. 221.

1474. Are any ecclesiastical parishes shown?—On the maps they are.

1475. Civil parishes?—Yes; since some recent alterations. That is just it. We are always changing. We never know where we are. The 25-inch maps of Eccles parish have "Parish of Eccles" printed in large type on the corner of each sheet. The name "Eccles" does not appear on the index map at all, neither do the names of other published parishes.

1476. (Chairman.) That (pointing to index) is the present 25-inch index; would that satisfy you?—That would not satisfy any one who wanted these parish maps of counties. I should not know which was which. Now that they are all filled in, it really becomes a map of the whole of Lancashire on the 25-inch scale. The index must therefore show the whole county, and not be merely an index to the four 25-inch maps contained in a 6-inch quarter-sheet.

1477. (Mr. Roby.) Are you speaking of the difficulty you find in wanting to get particular maps of particular parishes or particular maps of the 25-inch survey?—Particular maps of the 25-inch survey; I do not care a bit about the parish. There is another absurdity. We do not get the index till the maps are out. Every other nation on the face of the earth publish the index first to let the public know what maps they are going to publish.

1478. (Chairman.) Let us take another county?—I have one here; I got it two or three years ago just when the survey was issued. I was asked to get a large number of 25-inch maps of the county of Anglesey, and found the utmost difficulty in deciding what sheets I required from that index.

1479. You want a county index?—I want a county index.

1480-1. You think that there should be an index to the Ordnance map for each county?—An index to the cadastral.

1482. That should be in three forms. One for the 25-inch, one for the 6-inch, and one for the 1-inch?—Yes, I think it should; there could be three separate indices published.

1483. Three separate indices for each county, one for the 25-inch, one for the 6-inch, and one for the 1-inch?—Yes.

1484. And they could show the boundaries of all the counties?—Yes, and other divisions exactly in accordance with their description on the face of the sheets themselves.

1485. That follows, of course, they should show the boundaries of the parishes and a sufficient number of names to enable the public to find the sheets they require?—Yes.

1486. As a buyer, I have found it extremely confusing, looking at this sort of sheet, that the two indices are one on top of the other?—There is no harm in having it for those who are skilled at it and can interpret it. Sometimes you want to know where a place on one scale of map appears on another.

1487. The public, like myself, want a little indulgence?—There is no harm in having indices showing a lot of things together; but they ought to have the small indices as well, and the Ordnance Survey have done that recently, I know, with regard to the county of Lincolnshire on the 6-inch scale.

1488. (Mr. Roby.) You would not think, Mr. Crook, would you, that a county map is necessary to show the 1-inch survey. That might be for the whole of England, might it not?—I think so, quite well; on that county index of Anglesey the sheet lines of the 1-inch refer to maps which are not yet published, and if any one wanted a 1-inch map they would have first to get another index.

1489. (Chairman.) I think that is quite clear about the indices; they are not altogether satisfactory, and if published in three forms they would be better?—And I think, sir, that the indices to the maps should precede the publication or come out with the very first map. I wanted one of the borough of Ramsbottom; the town plans and the maps were all published, but the index was not. And then there is the question whether the Ordnance Office itself should be responsible for the index showing the state of publication, or whether they should leave that entirely to the agent. In France it is done by the Government Department—as in the case of that index I put before you yesterday.

1490. I suppose the Government Department do supply correct indices showing the state of progress from time to time, but what the agent does as he receives them in the course of the year is to complete his map?—I do not think the Ordnance Survey provides anything showing the progress of the Survey, except the diagrams in the annual report, but those do not give a satisfactory indication of the 25-inch scales or the 6-inch scales, because the sheet-lines cannot be shown on these small maps, it is a clear guide to the state of the 1-inch; but no guide whatever to the state of the 25-inch, except as roughly indicating the districts. There are no sheet-lines on it for parishes; it is quite impossible to show them on the scale of the index maps in the report.

1491. Are not there monthly notices showing the state of publication available to the public?—You can buy monthly notices and add them to the catalogue.

1492. You can always bring up the annual catalogue by buying the monthly notices?—You can bring up the annual catalogue, but there are no index maps.

1493. (Mr. Mather.) Have you any means of knowing now from Mr. Stanford what maps are available, that is, the new issues as they come out?—If I applied to Mr. Stanford, he would give me an index such as that I have just laid before the Chairman—of Lancashire coloured red, where the sheets are published.

1494. Those are available before the maps are issued now?—That skeleton index is available, but then Major Johnston has just told us that it does not belong to the new survey. Then there is not any index that does so. The agent is obliged to supply this index when an index is asked for, as he has got nothing else.

1495. (Chairman.) Now is there anything else, Mr. Crook?—There are one or two other questions which you have asked me incidentally, and which I should like to refer to. There is that question of the paper, which has turned up two or three times, the question of the paper on which the maps are printed. I understand—of course I am not a specialist in the production of the maps or the process by which they are produced—that the reason of the haziness of these photo-zincographs is largely due to the thick paper and the surface of the paper. Well, I believe the Stationery Office is responsible for the paper. I do not know whether the Ordnance Survey are able to get everything they want from the Stationery Office, or whether they have to produce their maps on the material which the Stationery Office provides within a limited range. It is a very important matter; it so much affects the quality of the maps. I understand, from an informal conversation with Major Johnston after one of the meetings of this Committee, that the thin paper is objected to by the public; they have got so used to this thick paper; but then I think the public has nothing to do with it. What we want is the map. I assume that the Survey do not publish maps for the sake of the paper, but for the sake of the map. One would think that a scientific department would select a kind of paper which would give the best chance of producing a clear map.

1496. The Department want to keep on good terms with the public?—The public is absolutely ignorant of cartographical matters; that is the business of the department deputed by the State to produce maps. When there is a difficulty it is the business of that department, not the public, to find a solution of the problem. We see the French and Germans can print clear maps; they use a smooth thin paper, but tough.

1497. That is a thin paper?—This vicinal map is a thin paper, but the detail on the map is very clear, considering the cheap manner in which it is produced.

1498. Do you know the method, Major Johnston, in which the paper is supplied?—(Major Johnston.) The paper is supplied through the Stationery Office, from whom we get every assistance in the matter. The reason of adhering to white paper is that it has been in use for a great many years, and that the public would raise very strong objections—as Mr. Crook has already done—if we were to change our paper, because adjoining maps would not match.

1499. (Mr. Mather.) But do you consider the paper hitherto used by the Department the finest quality of paper for the purpose of showing the map placed upon it?—(Major Johnston.) No; I do not think so.

1500. On what ground, then, has it been used; simply from habit?—(Major Johnston.) It has always been considered that the public require a strong paper—a

Mr.
H. T. Crook,
C.E.

19 May 1892.

Mr.
H. T. Crook,
C.E.
19 May 1892.

paper that will stand a great deal of wear—which can be drawn upon; something in the nature of drawing paper. That class of paper has always been used in our maps with one exception—of the yellow paper, to which Mr. Crook has referred in his evidence. Very strong objections were taken to the yellow paper on account of its softness and general unfitness for outdoor work, and in consequence of those representations the yellow paper was given up and the white paper reverted to.

1501. But the manufacture of paper has so much improved of late years that you can get the lightest paper now to be very serviceable, at the same time capable of taking the most perfect impression from plates?—(Major Johnston.) Well, we have not succeeded in getting a suitable paper which will match the existing stock; that is the real difficulty; there is no difficulty if we were to start fair. The difficulty is to get a suitable paper which will match the existing stock in appearance.

1502. You are continuing to use an inferior paper, because you have a large stock of that paper in hand?—(Major Johnston.) No; the reason is that we have a large stock of impressions printed on white paper, and we are tied to using paper which would match in appearance with already printed impressions.

1503. And those printed impressions are printed on paper which you would not now use if you began *de novo*?—(Major Johnston.) Yes, quite so.

1504. (Chairman.) When you have completed your map, and published a sufficient quantity of it on that old paper, you are ready to start afresh?—(Major Johnston.) Yes.

1505. At the present time, so long as you have not completed your issue, you are bound to continue the issue on the usual form?—(Major Johnston.) Yes.

1506. When you say the Stationery Office supplies the paper, I suppose you settle with the makers exactly the paper that you want, and they actually make the contract?—(Major Johnston.) We settle with the Stationery Office for the kind of paper, not with the makers.

1507. Do they submit samples to you?—(Major Johnston.) Yes.

1508. You do not go direct to the makers?—(Major Johnston.) No.

1509. Would it not be better to go direct to the makers?—(Major Johnston.) Well, I think it is probable that it would be.

1510. (Chairman.) What special knowledge have the Stationery Department of what is necessary, or what is the right quality of paper to produce a map on?—(Major Johnston.) None, I should say.

1511. Still, they send samples to you. You say, "That will do for us," and then they buy it?—(Major Johnston.) Yes, just so.

1512. (Mr. Roby.) May I ask this question: do you not use a thin strong paper as well as a thick one?—(Major Johnston.) When specially demanded, we print impressions on thin strong paper.

1513. Do you consider the map is better given on the thin paper than on the thick paper?—(Major Johnston.) I think on the thick paper; the thin strong paper is a bad printing paper.

1514. (Chairman.) The thin strong paper that you use?—(Major Johnston.) That we use.

1515. (Mr. Roby.) Who is the person who makes it?—(Major Johnston.) Evans.

1516. Probably by arrangement with the paper manufacturer you could get the most perfect paper for impressions in a thin quality. You have it here in the case of the French, for instance?—(Major Johnston.) The difficulty is that the demand for impressions on thin paper is very small indeed. The paper-makers will not make special paper, except in a very large quantity.

1517. You would say there is no difficulty in getting such a thin paper in a higher quality for good impressions if you gave an order sufficiently large?—(Major Johnston.) I think we could get a better paper; but the best printing papers are not tough enough. (Mr. Crook.) If they had started that when they made the alteration to the photo-zincographical method of production, there would have been no difficulty to the public, because you have altered the character of the

map already in adopting photo-zincography for your advanced edition; you might have changed your paper at the same time. There is nothing in the objection to the change of the style of paper, when you have already changed the whole appearance of your map.

1518. For the advanced edition there is no longer any engraving done, it is all done by photo-zincographic maps?—This advanced edition is itself different from the other maps; it will not join up with them, therefore if you had adopted a suitable paper then there would have been no difficulty.

1519. Have you any other points?—I would urge the importance of taking the paper question into consideration when we do start upon our national Survey, when the Ordnance Department is stirred up to the production of our great national cartographical map. I think it is very important that the style of paper on which it is to be produced should be considered beforehand, and adhered to throughout.

1520. We cannot go back on the past?—No; but it is very important to bear that point in mind. If the report of this Committee should lead to any recommendation for the production of a map of England on a uniform scale and style, and giving all the varied information that I have advocated that such a map should give, there must be some better way of getting an impression than this one on that paper. It is the haziness—the want of definition of the present prints that I think is so strongly to be objected to. The carefulness of the process and the original map is beautiful enough; but the surface of the paper, as I understand it, is the cause of that haziness of every line; instead of being true sharp lines, they are really a series of close dots.

1521. (Mr. Primrose.) I understood Major Johnston to say that the people who use the maps like that quality of paper, that their object in using the maps is to draw upon them very constantly, therefore they prefer the drawing paper, which has a roughish surface, to a very smooth surface?—Well, that difficulty could be easily overcome by doing what I suggested the other day, that this outline edition should be published, which is essential for administrative purposes, on thick paper, and the finished map, with hill-shading and the topography, should be published on thin paper, or rather on a paper which will give clear definition to every line of the print.

1522. (Chairman.) We might make a recommendation, if we think fit, that any new edition should be published on some different paper?—That the finished map, where the necessity for clearness is so great, should be published on some different paper.

1523. Where a distinct change takes place in the character of a map the Department might make any change that was necessary?—Yes.

1524. There is the difficulty of changing the paper and style for maps which have to be joined together?—Quite so; but they have already changed the character of the map.

1525. (Mr. Roby.) Looking to the different class of persons who use the different scales of maps, do you think thick paper is better adapted for the use of the users of the 6-inch and the 25-inch maps, or would you prefer a thinner paper even for them?—No, I am talking now of purely topographical maps; I am not talking of the large scale. The 25-inch is all right; it is a large map.

1526. (Chairman.) Your remarks apply to the 1-inch and smaller maps?—Yes.

1527. (Mr. Mather.) Then you would not propose to alter the paper for the 25-inch or 6-inch?—No, I do not.

1528. (Chairman.) You draw attention to the fact that the Irish maps are not contoured except Dublin county and, I think, one of the northern counties, because it was there where the contouring was commenced?—Yes.

1529. Are the levels marked in figures?—The levels are marked with figures; long lines across the country; they are put in by heights and distances, calculated levels. Then of course in Ireland there is no cadastral survey, except the county of Dublin. That you have had in evidence, I think, from the Director-General. Contours would be exceedingly useful in Ireland for all river drainage work, as showing the lie of the land. I should have found them invaluable for the purposes of river drainage, as they call it in Ireland; that is, improving the river systems to drain out bogs.

1530. Any other points?—I wanted to make a few remarks on levels; and there is the price of maps and the agency question I should like to go into.

1531. We are not to go into that point of agency?—Oh, you are not to go into that point.

1532. Well, Mr. Crook, you wanted to say something about levels?—The levels are given on the roads at intervals, and would appear to be put down so many to the mile sometimes without regard to indicating the point of change of gradient. Supposing you have half a mile of road which has risen at a steady gradient, the levels at the top and bottom are all that is necessary to give a true section of that road; but if that road should be passing over what I may call hummocky ground, some of the summits and some of the hollows might not have levels placed just at the change of gradient. It is not the inadequacy of the number of levels that is complained of, but that sometimes in the class of country I have described they are not distributed with quite sufficient regard to the form of the ground. When you are giving valuable information of that kind it is well to give it completely. I think it is a very minor objection, but it is one derived from experience which shows that occasionally the level at the essential point is omitted.

1533. (*Lieut.-Gen. Cooke.*) Not very often?—Not very often.

1534. Just occasionally?—Just occasionally. Where a section is required you have to go out with your instruments to make up these little gaps; it practically means levelling the road. If you could be perfectly certain that you could find levels at all changes of gradients, it would save you that trouble.

1535. I understand in most cases you have found that the levels have been all that is necessary to give a true section of the road?—Unless it is very hummocky country you will not find them amiss.

1536. According to your experience, have you found many cases in which you would have liked levels put in a different way?—Not very many, because the levels are so numerous; it is very seldom, I think, that happens.

Then there is the maintenance of the bench-marks, which is a very important point for the Committee, I think, to keep in mind. The value of the whole of this extensive work of levelling throughout the kingdom depends on those being maintained. Two-thirds of them disappeared in Lancashire and Yorkshire, Sir Charles Wilson said. Considering the lapse of time, I do not think that very excessive.

1537. (*Chairman.*) Now, in your opinion could they be protected by legislative enactment?—I think they might be in many cases. Of course if a property is pulled down you cannot protect the bench-mark.

1538. How would you distinguish between necessary destruction and unnecessary destruction?—Well, I call it wilful.

1539. I know what you mean; but I mean to say, would you allow a proceeding before magistrates in either case?—Where one was wilfully destroyed, most certainly.

1540. You would suggest that the police should be empowered to prosecute in every case of wilful destruction of a bench-mark?—Certainly.

1541. And that it should be within their discretion to select which is wilful and which is accidental?—I know a personal friend of mine had one cut on his gate-post, and he was going to cut it out, and I strongly recommended him not to do it. I said, "You had better apply to get one put on the other gate-post." He objected to the disfigurement of his gate-posts by these bench-marks.

1542. Supposing you have a stone stile—this occurs in my own neighbourhood—with a bench-mark upon it, and you want to get rid of that stile; you would not call that wilful destruction?—No, but I think in that case it should be necessary to give notice that you are going to remove the bench-mark.

1543. In fact wherever there is a bench-mark it should be protected by the necessity of giving notice?—By the necessity of giving notice. In one of the Cheshire canals at the present moment they are pulling down all the bridges—the Shropshire Union Canal. Upon each canal bridge there is at present a bench-mark, which of course will soon be swept away along the entire length of the canal. If there was a revision department for the revision of the survey stationed in each district, they should look after that; but until such

an establishment takes place, I think the county authorities might very well look after them, and order their surveyor to transfer them, or else a competent person might be specially kept by the Survey Department whose duty it would be to transfer bench-marks when notice was given of pending removal of the structure upon which they are cut.

1544. Do you know the provisions of the Ancient Monuments Act?—No, I do not know them.

1545. I was going to ask you whether you thought they would be applicable?—I know of the Act, but I do not know the detail of its provisions.

1546. You would suggest that in every case of removal of a bench-mark it should be necessary to give notice in order to render it not illegal to do it?—Certainly; that a person having a bench-mark on his property, before he can remove it, ought to make an application. The fact of its removal would then be registered, and then the county or the local authorities might send that information to Southampton, and it might be corrected on the map; perhaps the bench-mark might be omitted. It would save a great deal of time hunting these things up if they were corrected on the maps. If a bench-mark is not renewed; if it has gone, it should be taken out on the map.

1547. The difficulty would be to get sufficient attention given to these things by people to see when they are gone?—I think a great deal of destruction takes place by the ignorance of the public of the importance of these marks.

1548. How would you make the public know that they are important?—I think they would soon find it out if someone were prosecuted, even though he was let off for the first time.

1549. Supposing instructions were given to the police of the county that in the case of the removal of a bench-mark they were to communicate to their authorities; do you think the individuals of whom the police force is composed would notice that a bench-mark was going?—I should think they would. Of course at the present moment nine out of ten men in the force do not know they are there.

1550. They do not know a bench-mark when they see it?—In Lancashire where new bench-marks have lately been cut, people are all talking about the bench-marks; they say, "What do they mean?"

1551. The police in the district would soon know?—Quite as well as anybody. These bench-marks have just been cut in Lancashire; they have seen masons cutting them and surveyors about.

1552. (*Mr. Mather.*) Would it be useful to cut in the words "Ordnance Survey" at the same time that you make the mark with the arrow?—It makes more work, I think.

1553. (*Chairman.*) The public as a rule would not remove any boundary-post, township boundary or parish boundary. They are understood; the value of them is understood?—If anyone had such a post or mark let into the wall of his property he would not think of removing it. That is generally understood, I think.

Then, sir, I should like to mention, before we give up the small maps, the various prices of the 1-inch that the English Ordnance Survey supplies at the present moment, and continental maps.

1554. Yes?—The new series have 216 square miles on the sheet at the price of 1s., and on that map of France, which we have often instanced during this inquiry, you get 390 square miles on that sheet for 7½d., that is 75 centimes; so that the map conveys a great deal more information at about one-third of the cost. Taking the proportion between the two areas 216 and 390 square miles, one at 1s. and the other at 7½d., that is about one-third of the cost of the British map, and you have a more valuable map and a great deal more information.

1555. The French process is a cheaper process?—It is in all essentials correct. I think Sir Charles Wilson admitted that all maps made from plane table survey are for all purposes as correct as our own on that scale. It is certainly more valuable as a military and civil map than anything we have produced. Then the Scotch people have a sheet which contains 432 square miles, and they get that for 1s. 9d., so the Scotch people have got an advantage of a reduction of 12½ per cent. The price has a material bearing on the total public sales of maps. I think this is an important element, the quantity of area of the country which you

Mr.
H. T. Crook,
C.E.

19 May 1892.

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19 May 1892.

can get on a really good map at a certain price has a good deal to do with the popularity and the sales of a map. This French map you could buy in almost every French town; there is an agent for it. The conditions of agency require him to give so much window space to it; and he gets a commission of 40 per cent. on it.

1555. About 20 years ago I had great difficulty in getting a French map?—There is no difficulty in getting a French map now in any town of any importance; people can get at the map. It is cheap and easily accessible. That is what one would like to see our own publications.

Just looking over the map of Lancashire I found there were one or two more names of places which are wrong.

1557. You mean the 4 miles to the inch?—No, this is on the 1-inch survey and also on the 6-inch map; the sheet No. 71 Lancashire, which I had on the table the other day; there is Hoglowe Pike. It is a hill about 5 or 6 miles north of Bolton, and that should be Ughlow Pike; the Ordnance Survey have got it Hoglowe Pike. I know the property because it happens to belong to a friend of mine, and on all the old title deeds it is "Ughlow Pike." I do not know what authority there was for Hoglowe.

1558. Every name is spelt on the authority of three persons?—Here is the person who owns the land, and "Ughlow" is the spelling, and "Hoglowe" is the Ordnance version of it.

1559. I have heard a good deal of complaint from a gentleman about the names on his estate. I asked to see the authorities on the subject, and I find he headed the column?—That was very strange. These names are evidently in many cases the Lancashire pronunciation of the names, and the surveyor who took the name has taken it from the pronunciation of his informant.

1560. It is quite clear that this is one of the things no care will obviate—no care will obviate errors. Great care has evidently been taken over the spelling of names, because I asked about this, and I saw the original authority produced at Southampton and looked through and they are not taken on the authority of the surveyors, but they are really taken on the authority of individuals who are all named, and the diversities of opinion are also stated in a sheet, and they select the best, and yet you get blunders?—In this case I want to mention to you now: for instance, on the Lancashire map "Bongs" appears, and that is very nearly the Lancashire pronunciation of "Banks." This is "Green Bongs"; it simply means "banks" not "bongs." That made me think that the errors in the Lancashire names are nearly all due to taking the local pronunciation and not the true spelling of names of the places.

1561. Is it not possible for the person in the neighbourhood who has given the names to have spelt them, not according to their orthography, but according to the local pronunciation?—Yes.

1562. (Lieut.-Gen. Cooke.) What parish is that in, Ughlow?—I think it is Turton parish. It is the name of a farmhouse and a small property, and also the name of a hill immediately in the rear.

1563. (Chairman.) Do you think it would be an advantage, before publication, if a proof sheet were sent down to somebody in each county to look over?—I think it would be very desirable. It is very desirable to obtain correctness, and you see that I rather think that this very cautious mode of proceeding which you indicate, sir, is of comparatively recent adoption, and that the very fact of the Ordnance Survey having got them wrong originally is produced in evidence to get them wrong for the second time. The thing has been called wrongly on the old 1-inch map, and then your authorities refer to the old 1-inch map, and give you them wrongly again you see 50 or 60 years later. If a place has been misnamed on the Ordnance map, as it must have been in Lancashire for 60 years, the present generation which looks to its map, and probably often learns the name of the place from maps, will copy the name, and he knows it only by the name which appears on the Ordnance map. That may be the origin of some of the errors.

1564. I was quite astonished at the immense care taken over these names?—You said the question of the accessibility of maps as regards agency was not before this Committee at all, therefore it is no use my going into that point.

1565. I think that is outside our inquiry; it was dealt with last year. Accessibility we might deal with, but not as to the actual form of sale; last year a Departmental Committee considered the question how the maps should be sold?—I should like to draw attention to the accessibility to the public. In the old days, I believe, we used to get our maps in Lancashire direct from Southampton, or from the office in London. Of course, now the question of supplying the maps, owing to the enormous increase in the number of maps being dealt with by one establishment, enormously complicates the question of how these maps can best be got into the hands of the public. For instance, in that French map, that is done by the Minister of the Interior. He appoints his agents, they make an application on the proper form to be appointed agents to the Minister of the Interior, and if their references are satisfactory they are duly appointed, and they can supply the maps as much as they like of their own neighbourhood, or keep a stock up to a certain amount; but when you come to keeping the immense cadastral survey, and an enormous quantity of town plans, of 6-inch maps, and 1-inch maps, it becomes exceedingly difficult for any local agent to keep anything like a stock.

1566. (Mr. Mather.) What would you suggest, then?—Also with the enormous complication of maps, that it is very difficult for local agents to know anything about them for anybody who lives down in the provinces to get any information. The information can be obtained readily enough in London, but we cannot as a rule get it in the provinces, because the agents know so little about the survey.

1567. (Mr. Roby.) What do you suggest?—Well, I think if the revision establishment is made, that they should really provide the information with regard to the maps.

1568. (Mr. Mather.) You mean the revision department you suggested?—The local centres.

1569. Which do you think is the better plan—an independent office or shop belonging to the Ordnance Survey where they sell their maps or an agency such as Stanford's?—I do not believe in a Government shop at all; I think it would certainly be mismanaged.

1570. (Mr. Mather.) The less you have to do with the Government the better, I suppose, in these matters?—Yes, I think if some good indices were drawn up and were placed in our public institutions and libraries, local information given with regard to the maps of the districts round Manchester, Leeds, Birmingham, &c., and the style and purpose for which these maps are published, and if attention were drawn to their objects and purposes, information might be disseminated in that way much more largely than it is at present.

1571. Do you know whether in the Free Library of Manchester, for instance, it is possible for the public to get a view of the map of Manchester on a large scale?—I do not know that they have got in Manchester a map of Manchester on a large scale at all.

1572. (Chairman.) At present the indices are so confused that the uninitiated public do not recognise what the index means. If such indices were published as have been suggested to-day, in all probability they would be comprehensive, and then being distributed, the public would buy the maps because they would be able to find out from them what they want?—Exactly.

1573. (Mr. Mather.) And all the public libraries ought to have these?—All the public libraries ought to have these, yes.

1574. (Mr. Roby.) It has been suggested to me that if the post office in considerable places had the maps, at any rate of the smaller scales, of their own district always on view and good indices of the other scales, that that would probably meet the difficulty to a large extent?—You mean, to constitute them agents.

1575. To that extent?—They could not keep any stock in the post office.

1576. I do not mean having any stock, but having both the maps on the small scales of their own district on view and indices to the others?—Oh, they are not to trade with them at all, you mean.

1577. They would get them for you?—There would be great difficulty in getting the post office officials to understand a trade which is quite foreign to their business. The maps might be exhibited for public information; but it would be too slow if they had to send for the maps when ordered. What I should like to see is locally a good stock of the maps kept for 20 or 30 miles round the locality.

See Wilson,
p. 221.

See Wilson,
p. 221.

See Wilson,
p. 220.

1578. (*Chairman.*) If you have 100 or 125 agents, as has been suggested, you would practically have local agencies everywhere?—125 would meet all reasonable requirements, I think.

1579. They would have the maps within a reasonable distance; you would not go to Gloucester to buy a map of Essex?—No, you would not go to Gloucester to buy a map of Essex; you would have to apply to the central agent, no doubt; it would be unreasonable to expect that locally. I think that would improve the position in the counties.

1580. (*Mr. Roby.*) Do you know whether, as matter of fact, the local agent in Manchester keeps a stock of 1-inch and 6-inch and 25-inch maps of the neighbourhood?—He keeps a large stock of 1-inch, all round Lancashire and North Wales—the tourist districts of North Wales and the lake district; in fact he keeps as large a stock as any local agent for the Ordnance maps that I know. Of the 6-inch maps he keeps nearly the whole county in stock and very often he has—the cadastral map he never keeps—town plans of Manchester; very often he has a complete set of these.

1581. What else do you wish to tell us?—There is just one thing that I wanted to suggest that should be withdrawn from the annual report. This sentence, with regard to the method of production, page 7: "The great distinction between the operations of the Ordnance Survey and the work performed by civil engineers is, that on the Ordnance Survey all the operations are done by different persons, who therefore form a check upon each other." I think that is an unnecessary insult to the civil side of the profession, because the civil side never had the charge of the work in this country, and if the civilian were going to carry it out no doubt he would devise his own checks; he would be probably quite as capable a man as his military brother in directing operations or carrying them out.

1582. You would insert the words "hitherto performed, the work of civil engineers"?—No, because civil engineers have carried out large surveys in continental countries. Surveys which have been carried out by one man and his assistants are a very different thing. No man could do a national survey himself; he would naturally have to subdivide the work and devise a system of checks and counter-checks. I do not think this comparison or distinction is a justifiable distinction. It is dwelt upon from year to year; sometimes it disappears, but it comes back in the report, again and again.

1583. It is comparing work done under very different circumstances?—It is comparing work that has never been done at all. There is a previous paragraph which says, "Since its commencement in 1791, the Survey has always been carried on under military supervision, the military acting as superintendents to the civilian employés The chief supervision, from the Director-General downwards,

"has been vested in officers selected from the Corps of Royal Engineers. This organisation has been productive of incalculable advantage to the service. Military supervision has established habits of discipline, punctuality, order, and regularity; it has effected a considerable saving of expense." There is nothing to compare it with; there is no standard of comparison. There is a reflection on the civil engineer below, and there is no possible standard of comparison, for it has always been under military supervision.

1584. (*Mr. Mather.*) There is no object in those words?—There is no object in either of those expressions, except as a slight on the civil side of the profession. Then as to the report generally, I would suggest that much more interest would be displayed in the progress of the Survey if this annual report were made more interesting, like that of the Postmaster-General; explaining any new development that may have taken place in the Survey, and a general comparison with operations on the Continent, and so on. Some useful information given in it, instead of being a bald repetition year by year, of certain paragraphs with altered figures due to the advance in the acreage of the sheets published. If this were made an interesting report, it would get into the Press, and the nation would know a good deal more about the expenditure of this large sum of money.

1585. If they were to establish the superiority of the English over the German, French, and Norwegian maps you think our people would get some information?—I think there would be great difficulty in establishing that; but I think it might be made much more interesting generally to the public, instead of being full of bald technical statements such as it is. It is very seldom drawn attention to, for the simple reason it is so very uninteresting. It comes out year by year, and hardly anybody notices it. For instance, this year I have got all the notices of this report—all the paragraphs in the Press. I think they are only half-a-dozen in number. The newspapers generally are content to take out a paragraph here and there that the Survey has always been under military supervision; another takes out something about Plymouth, and another London. That is all the notice the public Press takes of it; just a few isolated statements are picked out here and there which may interest the locality in which a particular paper is published. As to the general progress, I would make this report a kind of annual review of the progress of cartographical science. I do not think it is too much to ask from the Directors of our great cartographical institution that they should keep us up in the progress of cartographical science, of the recent processes and developments.

1586. You mean in relation to our own country and other countries?—Yes, so that the public would be able to judge.

1587. (*Chairman.*) Have you any other point?—No, that is all I have to say, sir.

The witness withdrew.

Adjourned till Tuesday, May 24th, at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

SIXTH DAY.

Tuesday, 24th May 1892

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON R.E., *Secretary.*

Mr. J. G. BARTHOLOMEW called and examined.

1588. (*Chairman.*) You are a map publisher of Edinburgh; is that how you describe yourself?—Not primarily a map publisher; a map producer; a cartographer.

1589. Is yours an old-established business?—Yes, my grandfather was a map engraver.

1590. So that you have had great experience in the making and publication of maps?—Yes; I myself have

Mr.
H. T. Crook,
C.E.

19 May 1892.

See Wilson,
p. 221.

Mr. J. G.
Bartholomew.

24 May 1892.

Mr. J. G.
Bartholomew.
24 May 1892.

about 15 years experience in map making—about 12 years directly under my father, but my father has been retired from business for the last three or four years, and I have had sole charge of the preparation and production of our maps.

1591. Have you had any experience of the large-scale maps?—Not much. We produced a large plan of Edinburgh a few years ago, and we are now producing for the city of Glasgow a large plan.

1592. What did you reduce them from?—We reduced them from the 5-foot scale and brought the map up to date with special surveyors' work. This is a sheet of our large plan of Edinburgh.

1593. (Mr. Roby.) Did you publish that as well as produce it?—Yes.

1594. (Chairman.) Do you know what the date of the survey was from which you reduced that plan?—No, I could not say off-hand, but I know that we had a great deal to do. I dare say, perhaps, almost a fourth of the work of our plan was from our own special survey.

1595. You found it necessary to revise the plan to the extent of about a fourth by your own surveyors?—Yes.

1596. (Mr. Roby.) What scale is your map?—It is 15 inches to a mile.

1597. (Chairman.) Instead of 25 inches?—Yes.

1598. Can you give us any idea of the time that that survey required?—Well, it is difficult to say, because we availed ourselves largely of the borough surveyor's work and the borough engineer's work.

1599. Had the borough surveyor kept the Ordnance Survey map that he was in possession of pretty well up to date?—In some cases I understand the borough engineer has the special plans, and when his draughtsmen had not other employment, he employed them reducing these plans, and bringing the Survey sheets up to date.

1600. (Mr. Mather.) From the 5-foot Ordnance map?—The building plans are lodged with the borough surveyor, and he reduced these plans. He added to the information of the 5-foot scale, and brought it up to date.

1601. (Chairman.) Do you know from your own observation whether these additions to the Ordnance map were correct from a surveyor's point of view?—That I cannot speak to as a surveyor, but for all general purposes they were apparently quite correct.

1602. You have not tested them?—From personal knowledge I know that many were quite correct in the neighbourhood of our own building.

1603. Correct to a foot?—I have not tested them in that respect.

1604. You do not know that?—No, I do not know that. I do not look at it from a surveyor's point of view at all.

1605. Geographically?—Yes, topographically. Just as a map, not as a survey.

1606. Do you know on what scale your municipal authority requires building plans to be lodged with their town surveyor?—No, I could not say.

1607. You do not know, then, whether the builders' plans from which he altered the Ordnance map were all drawn to a uniform scale, or whether they were larger or smaller in scale than the Ordnance map?—They would certainly be larger in scale, and I rather think that the Dean of Guild Court requires that they should be of a certain uniform scale, but I do not know what that scale is.

1608. (Lieut.-Gen. Cooke.) Larger than the 5-foot or the 25-inch?—Yes, larger than the 5-foot.

1609. (Chairman.) What is your Ordnance survey at Edinburgh; is it 25-inches or 5 feet?—It is 5 feet to the mile.

1610. Do you think it would be practicable for the Ordnance Survey Department to trust to competent surveyors to keep the maps revised, and to adopt it from time to time as the Ordnance survey?—I think so, and I think it would be very desirable to increase the surveyors' staff for that purpose. The map might be brought up to date annually.

1611. Would that be an unreasonable requirement to make from the municipal authority, in your opinion?—I should think not; it would entail very little extra work. In the case of Glasgow they are doing that just now.

1612. Who are doing it—the Ordnance Survey Department?—No; the borough engineer is preparing the plan. We are drawing an engraving for the city of Glasgow just now on the scale of 12 inches to the mile for municipal use. The Ordnance survey there is so very old it is of little use. They have to be at the expense of preparing to a great extent a special survey of the city.

1613. Is that a new survey, or is it a correction from the building plans that have been lodged?—In some cases it is adapted from the building plans, and in some cases a new survey.

1614. Has the town authority made the survey or have you made it for them?—No; the town official staff make the survey.

1615. They supplied you with the materials?—Yes, and we engrave it.

1616. (Lieut.-Gen. Cooke.) On what scale is the original survey?—I cannot say.

1617. What is the scale of your engraving—your reduction?—12 inches to the mile.

1618. (Mr. Mather.) Is that considered large enough for all practical purposes?—It was the scale which they decided would be most useful. They want a plan for gas pipes and drain pipes and other municipal uses.

1619. (Mr. Roby.) If 12 inches is thought sufficient by the Glasgow people for gas and water pipe laying, why should the maps for the towns generally be on a so much larger a scale as 5 feet and 10 feet?—Well, it seems to me that publication on this large scale is almost unnecessary, and that a great deal of expense might be saved.

1620. For the survey, of course it is necessary?—For the survey it is necessary, but it need not be produced for general publication.

1621. Do I understand you have been making this map simply from the notes of the Survey?—No; from more or less finished drawings.

1622. (Chairman.) Have you anything else you wish to say to us about the large-scale maps?—No; I am not at all familiar with the large-scale maps. It is more with the general maps that I have had experience.

1623. Now we will pass to the general maps. You have issued a series of maps?—Yes.

1624. (Mr. Mather.) Are you aware that the Ordnance Survey Department have expended a great deal of money and a great deal of time in preparing maps of every town in England and Wales for the use of the local authorities. Those maps are larger in scale than those you have had to do with in Edinburgh and Glasgow on behalf of the corporations of those cities?—Yes.

1625. As I understand you, the preparation of these maps on these larger scales is not necessary, so far as your experience would tell you for town purposes?—No, I rather think it is unnecessary to incur the expense of engraving these specially large scales, the 5-foot scale.

1626. Would you consider it the most expeditious and at the same time the most accurate way of getting out the town maps for England and Wales and the United Kingdom to adopt the plan you have adopted in connexion with the corporations of Edinburgh and Glasgow, and have these maps prepared from the original maps of the Ordnance Survey Department by local survey and by local civil surveyors?—Yes, I think so.

1627. (Sir A. Geikie.) How would you guarantee uniformity of accuracy; what guarantee would you have that the borough surveyor was a competent man?—I think you might have the same guarantee that you have for the Survey officers.

1628. The Survey is a public department and is controlled by public money; but what guarantee would you have that every town which gave its plans out would have its survey conducted by competent men. Surely now and again there would be cases where the survey was not quite accurate. How would you ensure that except by careful supervision on the part of Ordnance Survey officers?—Well, I am not quite sure, but I rather think that in the case of every town they must have a certain number of properly qualified surveyors that have passed examinations. They also in Edinburgh train up younger men as surveyors, and it might be arranged that the work would be under the super-

vision at all events of surveyors who had passed their examinations as such.

1629. (*Mr. Mather.*) From your own experience in relation to Glasgow and Edinburgh, are you prepared to say that your maps are now equal to anything that could have been produced or has been produced by the Ordnance Survey Department—I mean as to accuracy?—No, I should not be prepared to say so, because we have just aimed at sufficient accuracy for the purpose required.

1630. But what was the purpose required?—A general map on this scale. We have not, I dare say, put in all the detail that is usually shown on the Survey.

1631. For instance, you know on the Survey a glass roof is shown over a passage. Do you go to these niceties?—We consider we rather improve our maps by omitting these details.

1632. Then your map is chiefly for the general plotting out of buildings upon the ground and showing the streets for the purpose of pipe laying and sewer construction?—Exactly.

1633. (*Chairman.*) Following the question of Sir Archibald Geikie concerning the accuracy of maps prepared by local surveyors, do not you think it would be a more convenient and an equally accurate method of producing these large-scale maps if such work were committed to the local authority who would employ local surveyors for the purpose. Would not local knowledge come in there, and the accuracy could be tested by the local authority as well as by the Ordnance Survey Department?—I should think so. It would save duplication of work, and if the Ordnance Department could, as it were, share the expense of keeping one or two extra surveyors on the town staff, then the special survey expenses might be saved altogether.

1634. But apart from expense, would you consider, as a method of getting accurate town maps for England and Wales, or the United Kingdom, that the work done by the local authority with competent civil surveyors would be as well done as that now accomplished by the Ordnance Survey Department?—I should think so certainly.

1635. Because the difficulty now with the department is that a large staff is occupied, and an immense amount of time and trouble is taken with these maps which are published for local government purposes, and the true Ordnance survey of the country has been very much held back in consequence. Your opinion is therefore that work could be done by the local authority, and accurately done, if sufficient provision were made for it without considering the question of expense?—I think so; perfectly well.

1636. Are these reductions of yours from the engraved plates?—From the engraved plates, yes.

1637. (*Lieut.-Gen. Cooke.*) On copper?—Yes, on copper.

1638. (*Chairman.*) And printed from copper?—From the stone.

1639. (*Lieut.-Gen. Cooke.*) Transferred to stone?—Transferred from copper to stone and printed from the stone.

1640. (*Mr. Mather.*) Have you a map here to show us?—I have here a map of the town of Edinburgh, 15 inches to the mile.

1641. (*Mr. Roby.*) Your main work has been making maps of large countries and areas, atlases?—Yes; atlases—geographical maps.

1642. (*Chairman.*) With regard to small-scale maps you have issued a series of maps of Scotland?—Yes.

1643. Without hill-shading?—Without hill-shading; with the contours and coloured. I have a sheet here.

1644. You have issued that with contour lines, and you have issued that series in two forms, namely, one coloured in counties, and one coloured in contours?—One in counties and parishes, and one in contours.

1645. (*Lieut.-Gen. Cooke.*) On what scale?—Half an inch to the mile.

1646. (*Chairman.*) Do you find that one of those two is more popular than the other?—Yes; decidedly. That with the contours coloured is the more popular.

1647. (*Mr. Roby.*) You do not mean the contour lines are put in in colours?—No; tinted between the contour lines.

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1648. (*Chairman.*) You keep on changing the shade as you get higher?—Yes.

1649. What is your process? Do you photograph this down from the 1-inch map?—From the 1-inch map; and then there are a great many additions—roads, railways, footpaths, houses.

1650. You find that the 1-inch map is defective, and has to be filled up?—To be corrected to date.

1651. (*Mr. Roby.*) Is much correction required?—Yes; a good deal for tourist purposes. There are the new railways, and many of the roads shown on the Survey are now actually ploughed over. They do not exist, and there are many footpaths which are useful for tourists which have to be added, new hotels and new houses.

1652. Even in the mountainous parts of the country?—Yes.

1653. You have sent your surveyors all over Scotland in order to do this?—No; we do not send surveyors. We get corrections from various sources. We often write to local surveyors, and pay them to bring the map up to date; county road surveyors, I think they are called.

1654. Do the public prefer to buy your maps to buying the 1-inch maps?—The public do not seem to buy the 1-inch Ordnance maps at all, because they are not in the shops for sale.

1655. You do not sell the Ordnance maps?—No.

1656. (*Mr. Mather.*) You do not sell the Ordnance maps because of your having maps of your own?—We do not directly sell maps at all.

1657. (*Mr. Roby.*) You have not a shop?—No.

1658. (*Mr. Mather.*) You are publishers and map makers, as you say?—Yes.

1659. (*Chairman.*) Is there any agent for the Ordnance Survey in Edinburgh?—Yes, Menzies and Co., but the general public do not know anything about it, and Menzies simply supply the sheets when they are specially ordered; they do not take any steps to make them known—to advertise them.

1660. (*Lieut.-Gen. Cooke.*) Do they keep indexes of the sheets for reference by the public?—They have some indexes, but we quite as often have to send to Southampton when we want indexes.

1661. (*Chairman.*) Is it more profitable to the publisher to sell your maps then to sell the Ordnance Survey maps?—I think it must be so. I do not know what profit they derive from the sale of the Ordnance maps; but judging from their exertions to sell our maps it must be more profitable.

1662. With regard to the spelling on the maps; have you adopted the Ordnance Survey spelling?—As a rule. But in many cases we have also given phonetic spelling in parentheses.

1663. (*Mr. Roby.*) In addition?—Yes.

1664. (*Sir A. Geikie.*) The Highland name?—Yes, the Gaelic name.

1665. (*Chairman.*) You have not found any fault with the Ordnance Survey spelling of names and forms of names?—Yes, frequently.

1666. Do you think the Ordnance Survey method of spelling names has been defective?—In the case of Gaelic names. I do not speak from actual experience; I merely speak from hearsay; but I have heard great dissatisfaction expressed with the Ordnance spellings and I have heard it stated that they took the spelling from people who were not qualified to give the information.

1667. Are you a Gaelic scholar yourself?—No, I do not know Gaelic.

1668. Are these maps of yours engraved?—Yes; they are engraved on copper.

1669. And printed from stone?—And printed from stone.

1670. (*Mr. Mather.*) You use the 1-inch Ordnance map as base of alterations?—Not for that map of Edinburgh. This is reduced from the 6-inch map.

1671. How do you reduce it?—By photography. The additions were very extensive on that map.

1672. (*Chairman.*) You produce your maps in two forms?—We have one or two special district maps on a larger scale.

Mr. J. G.
Bartholomew.

24 May 1892

Mr. J. G.
Atholmear.

4 May 1892.

1673. (*Mr. Mather.*) That map (a tourist's map) had to be printed with a lot of new matter which you or your surveyor had to get for yourselves?—We spent a great deal of money on the correction of that map. We had actually to send surveyors to certain parts of the county to add roads and buildings.

1674. Are you prepared to say that the information given on that map is as accurate from your survey as any information could have been from the survey of the Ordnance Survey officers?—No; we did not aim at absolute accuracy at all; only the accuracy necessary for the tourist.

1675. (*Chairman.*) From the 6-inch map you have omitted all the fences and you have corrected all the roads up to the date of your publication?—Yes.

1676. And that required a considerable amount of work on the part of your surveyors. Had the railways not been added to the 6-inch map?—I do not think so; certainly not all. For instance, the new line to the Forth Bridge would not be shown neither would the bridge itself.

1677. Now in printing these maps which are contoured you have as many printings as you have colours?—No, not at all. We have combinations of printings. We may, for instance, only have three printings and we may have nine or ten colours.

1678. (*Lieut.-Gen. Cooke.*) Blue and yellow will produce green, I suppose?—Yes, and then we have different shades of the same colour in printing. We employ stipple tints.

1679. (*Mr. Mather.*) Do you do that by stencil plates?—No, lithographic printing. That is an imperfect print; the map is not printed from the machine yet.

1680. (*Mr. Roby.*) Just to identify the map, perhaps you would describe it?—It is a map of the neighbourhood of Edinburgh.

1681. (*Chairman.*) You are well acquainted with all the Ordnance Survey publications?—Yes.

1682. Can you give us any suggestions with a view to improving the Ordnance Survey maps; are they to your mind satisfactory?—No, I should say that the 1-inch map, for instance, ought to be brought up to date annually, and I think it might be quite readily done if you had district surveyors. For instance, for Scotland I think that three surveyors could quite well keep the map up to date annually. For the northern counties say one surveyor. He could not of course do more than the 1-inch map; he could not do the larger scales; but you could keep the 1-inch of Scotland, I should think, quite well up to date with three travelling surveyors.

1683. It would be desirable to keep the revision of the 1-inch map apart from the revision of the large-scale maps?—I think so. Of course that could be done with comparatively little expense.

1684. The 1-inch?—The 1-inch.

1685. (*Sir A. Geikie.*) You mean that alterations should be made on the 1-inch scale?—Yes; I should think three district surveyors each with so many counties allotted to them could, working in conjunction with the borough surveyors, easily keep the map up to date.

1686. And if that map was kept up to date then it would sell?—Well, there are other points. At present you permit reproductions of these maps—photo-lithographic reproductions—to be sold.

1687. On a different scale?—They are done practically on the same scale. I mean just slightly smaller and in some cases larger. If you permit these photo-lithographic reproductions of course they can quite readily undersell your Survey publications, if you want to sell your publications at a profit, because they have no expense in the production of the map beyond the actual printing.

1688. As a private printer and publisher are you inclined to say that any reproductions of the Ordnance map should be prevented?—Most certainly, any direct reproduction. Of course that is quite different from maps based on survey. The actual photo-lithographic reproductions ought to be prohibited.

1689. You would not call your maps photo-lithographic reproductions?—No, they are separate maps. In the case of the reproductions they do not bring them up to date; they are simply photographic reproductions.

1690. (*Mr. Roby.*) Supposing, in estimating the price of the Ordnance survey to the public, you charge only the expenses after the map is made, why should it be any cheaper for the publisher to sell it than it is for the Ordnance Survey; why should a publisher be able to make a photograph and copy of it for the public and sell it cheaper than the Ordnance do, if the Ordnance charge nothing but the expense after the whole map has been made?—I did not understand that the Ordnance charged nothing but the expense of printing.

1691. That is so when it is printed from copper?—I did not know that.

1692. (*Chairman.*) Have you any difficulty in supplying yourself with engravers?—Yes, considerable difficulty, because we train a number of apprentices (we always have five or six apprentice engravers), and as soon as they are at all competent they are very often taken off by the Survey, either by the Survey in this country or in America, and it is a standing grievance with us that the Survey does not train apprentices to do its own work.

1693. (*Mr. Roby.*) They leave you to train them, and then they buy them when they are already trained?—Yes.

1694. (*Chairman.*) Do you know of any men of yours that are in their employ?—A number of them; not so many recently, but years ago many went off to the Ordnance Survey as soon as their apprenticeship was finished.

1695. Have you any hill engravers?—Yes, we have two, but they are not very efficient. We do not do much hill-engraving.

1696. Do you find that hill-engraved maps are popular or not popular?—We find that the contour colouring is quite as well liked, and it is very much cheaper. Hill-engraving is so expensive that we do not use it mainly on that account.

1697. Are the contour lines, without being coloured, satisfactory, in your opinion?—Colouring certainly shows the configuration at a glance, and helps materially the eye.

1698-9. I asked you which of these two maps the public preferred, and you said the one coloured in contours; do you consider the Ordnance map of Scotland to be perfect?—It is out of date and imperfect in many respects. For instance, in Edinburgh it does not give the height of the Calton Hill, and in the Trossachs Ben A'an is not indicated, and there is no height given. There are very many little points like that which might quite well be corrected.

1700. Attention has been called to the omissions?—Certainly.

1701. (*Chairman.*) You say the height of the Calton Hill is not marked?—No.

1702. I have a sheet of Dumfries here; I see elevations of 300 feet are all marked?—Yes, the contour lines.

1703. (*Mr. Mather.*) Apart from one or two features of that kind, is the whole contoured map, finished, in your opinion, as well as need be?—No, I should say it would be better if the contoured map were printed in colours, printed from the stone after the style of our contoured maps.

1704. Not hill-shaded?—Of course, since the map already exists with the hill-shading, it is no doubt useful for many purposes, and would be appreciated by some people; but as a rule hill-shading, where there is any considerable altitude, obliterates the lettering to a great extent.

1705. (*Chairman.*) There is a very mountainous district (Jura and neighbourhood), do you consider that is defective; from a map-producer's point of view I suppose you would say that is a very beautiful hill-shaded map?—Yes, certainly; it is a very beautiful piece of work.

1706. But would you prefer the shading of the contour map, to that shading in the condition in which it is now?—For many purposes I should prefer it as it is, but for other purposes I should prefer it with contours. One cannot judge of the comparative height very well from this; but then again from the contour map one does not see the actual form and configuration of the minor features of the relief.

1707. Not even if the contour lines were coloured?—No; one gets pretty much only the general altitude and comparative height.

See W. I.
p. 221.

1708. If you were going to produce a map of the country, considering the great additional expense of hill-shading, would you produce—a contour map or a hill-shaded map?—It depends for what purpose the map is required.

1709. Will you define exactly for what purpose a hill-shaded map is better than a contour map?—You instance, on a contour map—in a contoured issue of this actual sheet—one would not see the relief of the lower grounds here; that would not be brought out at all; but for general purposes that might not be necessary.

1710. Contours are more effective when you come to very marked features?—Yes. The minor features would not be shown at all on a contour map and are not shown on the contoured issue of this sheet.

1711. (*Lieut.-Gen. Cooke.*) For instance, you show no variation here between 500 feet and 1,000 feet?—No.

1712. Any variation of ground between 500 feet and 1,000 feet is lost in this map?—Yes.

1713. Mr. Selig. However, this map is not simply a contoured map, or even a map with contour lines in colour. It is a map with the whole interval between 500 feet and 1,000 feet filled up with colour?—Yes.

1714. Sir A. Geikie. Can you suggest to the Committee any more perfect way of representing the topography of the country than that hill-shaded map?—

1715. *Lieut.-Gen. Cooke.* Taking into consideration that it has to compare with the foreign maps of Europe—I should suggest a combination of the two, consistent with the hill-shading. I forget the technical name of the combination. It is used in the United States coast survey. They consider that it is almost the most perfect and effective way of showing the physical relief.

1716. Sir A. Geikie. But still it is a form of shading?—It is shaded only to give the contours, as it were, graphic effect.

1717. (*Lieut.-Gen. Cooke.*) Do you mean vertical shading or horizontal shading between the contours?—No, I mean tinting; it gives pretty much the effect of the mountain.

1718. It is brush shading?—Yes.

1719. Sir A. Geikie. The point I wanted was not so much the system or style of hill-shading; but is there any system by which you think the general topography of the country could be shown more faithfully and more graphically than it is by a system of hill-shaded maps. You have admitted that the contoured map does not quite fulfil the functions of the hill-shaded map?—No; but I think that the contours might also be added to this.

1720. Quite so; that would combine the excellencies both of the hill-shaded and the contoured map?—Yes.

1721. (*Mr. Roby.*) Have you seen this map of the Isle of Wight?—Yes.

1722. It has the contours, I think, in coloured lines?—No, the contour lines are in black; the roads are coloured in brown, the rivers in blue.

1723. (*Mr. Roby.*) Is that a style of map which you think would be satisfactory?—It is printed evidently in the same style as the French maps *minimie*.

1724. (*Chairman.*) Do you approve of that?—Considering the amount of work spent on it, I do not think it is a great improvement on the simple black print.

1725. Mr. Selig. Do not you think it is a great advantage to have water distinguished by a blue colour?—No, our experience is that there is always a certain liability to defective register, and in the case of a river running along the side of a road in the printing it sometimes comes on the top of the road and sometimes on the wrong side of the road. One cannot be absolutely sure of accuracy when one printing has to be another.

1726. *Chairman.* You are not in favour, then, of various colours in printing?—No; I think it is better to have all the work printed from one plate for the outline of rivers, roads, &c., because there is always a liability to mis-fitting when they are printed separately.

1727. Would you be inclined to print the contours in colour?—I think that it is a decided advantage to have them coloured.

1728. Mr. Selig. There would be a little risk again there?—There would be no risk there, because it does not affect the correctness of the outline, the actual

topography; it merely aids the eye to follow the contours.

1729. Sir A. Geikie. But still the register of the contours might be wrong?—No; because the contours are printed in black with the rest of the outline. The contours of this map, for instance, are printed in black lines.

1730. The suggestion is to print the contours in colour. *Chairman.* Supposing a map is printed in black and it is proposed that the map should also show contour lines, would it be advantageous to print the contour lines, not in black, but in some distinguishing colour, that being the only colour on the map?—If you treat the intervals between the contours in this style (referring to the contour map), I should say it would be no advantage to have the actual lines printed in colour.

1731. Supposing the contour lines are printed in colour on a skeleton map, might it be desirable also to repeat them in colour on a hill-shaded map?—It depends on the number of contour lines and the system of hill-shading. It might possibly be that by printing a great number of contour lines on the top of them you would destroy the graphic effect of the hill-shading, and it would just produce a muddle.

1732. And that muddle would not exist if the contour lines were printed in black?—Perhaps not; but the drawing would have to be carefully considered.

1733. (*Sir A. Geikie.*) Still the difficulty would arise that if you printed your contour lines in colour you could not insure an absolutely accurate register with that any more than you could in printing water blue?—I think contour lines are not exactly the same as the skeleton lines of rivers and roads.

1734. (*Lieut.-Gen. Cooke.*) What you mean is that you would not detect the shifting of the register in the contours?—No; I mean to say that a contour line is not an actual surface feature, and a slight defect in the register would not be so serious.

1735. (*Sir A. Geikie.*) Supposing you had a contour line, we will say of 2,000 feet, just round the summit of a hill. Is it not conceivable that your register might be so imperfect that what appeared to be the summit of the hill was not really so owing to the whole thing having shifted a bit so that the summit of the hill was outside your ring?—Yes, but all the summits of the hills would be shown by points.

1736. You cannot make a figure or a point for your hill-top. I am afraid that the system would introduce a certain amount of inaccuracy into the maps?—Yes, it might, I should rather prefer them absolutely accurate in black. Even on this sheet here (a map of Brighton) the contour lines printed in red do not exactly agree with the engraved lines. They are considerably out in some parts.

1737. (*Chairman.*) What is the scale of the map?—This is a 1-inch sheet (Brighton). That shows the danger of inaccuracy there would be, as Sir A. Geikie points out.

1738. (*Mr. Mather.*) May I refer for a moment to a question put to you a little while ago as to the 1-inch scale map. Take Scotland, are we to understand that you consider this hill-shading to be the best form of style in which the map can be published together with contour lines in black which hitherto have not been shown?—I should say that to my mind the best system would be to have the contour lines engraved in black as on the map and the hill-shading printed in brown on the top of that. That would be my ideal for the 1-inch.

1739. (*Chairman.*) Will you take that map (Great Yarmouth)?—This is an illustration, but the hill-shading is very roughly done here. It is lithographed not engraved.

1740. (*Mr. Mather.*) Take this part of Scotland (Jura and district). The hill-shading there is a very expensive process. Would you prefer it with contour lines, though it might not be quite so accurate as the hill-shading done in black?—I should like this hill-shading as here engraved printed in brown, and not in black.

1741. It is simply a matter of colour. The particulars would be the same?—The map would be much clearer, and the lettering and contour lines would be legible.

1742. In black?—They would be actually engraved on the outline of the plate.

1743. There are no contour lines here?—No.

Mr. J. G.
Bartholomew.
24 May 1892.

1744. That in your ideal map?—Yes.
1745. (*Sir A. Geikie*.) In your ideal map how could you again ensure absolute accuracy of register between the brown and the black? (*Lieut.-Gen. Cooke*.) It is quite evident that the inaccuracy would be the same as in the case of a road or stream, but it would not be so palpable to the eye. (*Mr. Roby*.) In printing that map (map of the Isle of Wight) in colour, would not there be danger of its not registering perfectly?—It would not so much matter if there were any slight defect in the register, because it would be corrected by the contour lines.

1746. Are there contour lines on that map?—Yes.

1747. That is one of the 1-inch Survey maps with the contour lines, and with the hill-shading in brown colours?—Yes.

1748. Do you think that more satisfactory than having the hill-shading in black?—I think it would improve the map if we had tinting to distinguish the comparative heights, if, for instance, the low grounds up to 500 feet were tinted green, it would not confuse the map, and it would help the eye very much in consulting the map.

1749. (*Chairman*.) You could do that even on a hill-shaded map?—On a hill-shaded map.

1750. (*Mr. Roby*.) Would that involve three printings, one for the black, one for the brown, and one for the green?—Yes.

1751. And consequently chances of inaccurate register?—It would not matter in the case of the tinting whether the register was absolutely accurate or not. It would not affect the accuracy of the map, although the register were wrong.

1752. (*Mr. Mather*.) Because the contour lines would be all right?—Yes.

1753. (*Sir A. Geikie*.) But in cases where a map is required to be coloured afterwards the colours would be an objection, would they not—the brown, and more particularly the green. If you wanted the map coloured for any other purpose the presence of these colours would be an objection?—Yes, undoubtedly they would for some purposes.

1754. (*Mr. Roby*.) You were speaking earlier about the 1-inch Ordnance maps not being much sold in Scotland. To which of these three causes do you attribute that, either to the map being old, or to the map not being finished so as to suit ordinary tourist's eyes with colour, or to its not being kept ready mounted and adapted for the pocket or for hanging on the wall?—It is mainly due to the fact that it is not brought before public notice. If the publication of the map, for instance, were in the hands of a private firm the sale would be very different; it could be made a matter of considerable profit.

1755. Are not Menzies in Edinburgh people in the same kind of position as Stanford's here, who are in the habit of producing maps and selling them?—Not exactly; but even in the case of Stanford, the Survey map is not sold as it might be.

1756. As it might be, if what?—If it were brought more prominently before public notice.

1757. (*Mr. Mather*.) And if it were brought up to date in information?—That is really not the main point, I think.

1758. (*Chairman*.) Not the accuracy, not the being up to date?—Of course the scale is large, and the sheets are pretty large, but our $\frac{1}{2}$ -inch map includes a much larger area, and contains all the information wanted by the general tourist.

1759. (*Mr. Roby*.) You think the 1-inch survey a little too large for convenience?—For the general tourist; but apart from that, if it were better known it would be very much more largely purchased.

1760-1. Do you think it is expensive. Has its expense anything to do with it?—I do not think it has. If it were printed by lithography, as our maps are, then it could be produced much cheaper than plate-printing.

1762. The sale of your maps, I suppose, is very large?—No, not very large.

1763. They are sold at all railway stations in Scotland?—Yes, at the principal railway stations—at the bookstalls.

1764. (*Mr. Primrose*.) What discount do you allow on the sale of your maps?—Not being actual booksellers we leave that to our different agents to arrange.

1765. But you get a certain price on each map sold, I suppose?—We as a rule give our maps to the agents at about half price.

1766. Off the selling price to the public?—Half of the selling price.

1767. (*Mr. Roby*.) Do you consider the details shown on the Ordnance Survey 1-inch satisfactory, or would you make a distinction between the different classes of roads more than they have done, or in a different way?—Yes; I think there ought to be a difference made between private roads and public roads.

1768. (*Chairman*.) Do you show that on your maps?—No, because it is rather difficult to do, although the Ordnance might do it.

1769. (*Mr. Mather*.) Do you mean roads over which there is no right of way?—Yes.

1770. You call that a private road?—Yes, we have tried to do it in one or two cases, but it rather involved us in legal proceedings.

1771. (*Chairman*.) Would not the same difficulty arise with the Ordnance Survey?—Yes, but it would be a great advantage to have the matter settled.

1772. There is some question in Scotland about access to mountains, is not there?—Yes. The Ordnance Survey could settle such points very much better than a private firm.

1773. (*Mr. Roby*.) Do you think that some such distinction as this would be satisfactory; between well-made driving-roads, inferior driving-roads and foot-paths, or would you require anything more, irrespective of legal questions as to the right of way?—Yes, I think that would be much appreciated.

1774. (*Chairman*.) Do you think the distinctions now made in the Ordnance map are insufficient?—Yes.

1775. (*Mr. Mather*.) Take that map (Portsmouth and the Isle of Wight). The Isle of Wight has a great number of roads, you see, of all kinds?—If the distinction of different roads were kept up to date they would be very satisfactory, but with regard to many such roads, especially in Scotland, and in the Highlands, roads that are shown on the Ordnance map as carriage roads are scarcely visible as tracks across the hills now; they have been disused for so many years that they are covered over with heather, and are not even traceable, and many of these are shown prominently as carriage roads.

1776. (*Chairman*.) Macadamized roads?—Yes.

1777. (*Mr. Roby*.) I suppose you consider the most important thing of all is to keep the map up to date?—Yes, to keep it up to date.

1778. You think it would be well worth while an additional sum of money being granted annually to the Ordnance Survey for that purpose?—I do not think that it would be necessary to grant more money at all. I think that the Ordnance Survey might be made to pay; it would pay to keep it up to date, and there might be a large profit. I think if the Survey were to arrange with private firms for the production of the maps for public sale—for general use—it would pay all the expenses of production apart from original cost of plates.

1779. (*Chairman*.) And if the map was kept up to date?—It would pay all the expenses of keeping the map up to date with a surplus.

1780. (*Mr. Roby*.) That would assume, I suppose, the whole survey having been first completed, and the map brought fairly up to date to start with?—Yes, it would need to be brought up to date to start with. My ideal of the working of the 1-inch survey would be that there should be the district surveyors to keep the map up to date, and that anyone writing to the Ordnance Survey Office might at any time get a proof from the plate up to date, but that the Ordnance Survey should arrange with private firms for what might be called the popular production of the map in cheaper forms for general use.

1781. (*Lieut.-Gen. Cooke*.) On the same scale?—On the same scale. For instance, say that I have this contoured map to produce, very much in the same style as our $\frac{1}{2}$ -inch coloured maps, that need not be directly at the Government risk. It might be arranged with private firms that they would pay so much for the right to issue the map in different forms, but that for official purposes the map could always be had as it is had now from the Ordnance Survey Office.

1782. (*Chairman.*) The accuracy of the survey would depend on the Ordnance Survey Department and the colouring and all the finished articles would be supplied by the publisher?—Yes, by a general publishing arrangement.

1783. (*Mr. Mather.*) And each map stamped of course with the source of publication?—Yes.

1784. (*Lieut.-Gen. Cooke.*) Do you think it is desirable that the Government should take in hand the publication of maps on a smaller scale than 1-inch?—No; I think that should be left to private enterprise. I think if the Government produce the "mother maps," private enterprise would produce the smaller maps.

1785. You would not have the Government go below 1 inch to a mile?—No; but I think in order to ensure the production of satisfactory maps on smaller scales by private enterprise the Government ought to prohibit the mere photographic reproduction of the 1 inch.

1786. (*Mr. Roby.*) Is it now actually produced and sold on the 1-inch scale?—Not actually on the 1-inch. It is produced and sold on a slightly smaller scale, such as this sheet here.

1787. (*Sir A. Geikie.*) Is that produced by Johnston?—Yes.

1788. (*Mr. Roby.*) This is part of the map, not the whole sheet?—It is a reproduction of a contoured map, but coloured into parishes.

1789. (*Lieut.-Gen. Cooke.*) You do not object to their having this, but you say they should pay for it?—Yes.

1790. (*Mr. Roby.*) It is photo-lithography?—Photo-lithographic reproduction.

1791. (*Mr. Mather.*) Do you consider a larger income would be obtained for the Department by giving this free trade in maps throughout the country and receiving something for the material supplied than by publishing the maps themselves?—Yes, very much more.

1792. A larger revenue?—There would be a larger revenue according to the terms that might be arranged. There would certainly be a larger sale of the Ordnance maps.

1793. A larger sale of the maps proper or maps reproduced by the general publishers?—I did not mean reproduction without authority. For practical official purposes it would be always desirable to get the maps from the Ordnance Office, as they are at present issued, without any colour; but for popular purposes if an arrangement were made with private firms that they paid so much for the right of publication or paid a royalty on the actual sales, then they would get transfers from the engraved plates of the Survey, and print from the stone.

1794. You say production from the stone; that would be done entirely by the private publisher?—No, not at all. I mean that the private publisher would pay so much for the right to print the Ordnance maps from the stone.

1795. (*Mr. Roby.*) Would he get the stone from Southampton?—He would get the transfer of the plate.

1796. (*Chairman.*) Is that the method they adopt in France?—I understand they do so for the cheaper issues of the Survey maps.

1797. This is what they call the *carte vicinale*?—Yes.

1798. This I see is engraved and arranged by the Government department, but it states that it was engraved and printed by Erhard, lithographic engraver, that is a private publisher; he has got a transfer from the original plate?—No; that map is produced by Erhard.

1799. (*Lieut.-Gen. Cooke.*) The original is in manuscript; the Government original is in manuscript only?—No, I understand that the whole of that map as it is there is produced by Erhard for the Government.

1800. (*Chairman.*) For the Government?—It is a Government contract.

1801. (*Lieut.-Gen. Cooke.*) The Government supply the manuscript map only, you think?—I do not know as to the actual production. As far as I understand, Erhard engraves and prints the map and also publishes it.

1802. This is evidently the Government MS. (*Chairman.*) It is Government MS., and what has Erhard got to do with it?

1803. (*Lieut.-Gen. Cooke.*) They give him the MS., and he engraves and publishes it.

1804. (*Chairman.*) I wanted to know whether that was a private speculation of Erhard's?—No, not at all. They pay him for the engraving and printing of that map in the same way as is done in the United States; there private firms are employed for the engraving and printing of Government maps.

1805. (*Sir A. Geikie.*) You have told us that you think a sum ought to be paid by anyone who produces a map such as that of Johnston's. You told us that is simply what you may call a piracy; you have also produced one of your own maps; but what I should like you to tell the Committee is on what principle you would prevent the reproduction of a map in that style (Johnston's) and allow a reproduction of a map in this way (Bartholomew's), so that it may be on our minutes. What principle would you adopt for allowing a reproduction of an Ordnance map in one style and preventing it in another?—Well, in the case of our maps, we engrave the plate anew. It is not a reproduction in the sense of Johnston's.

1806. (*Witness continuing.*) We prepare a new map, merely using the information published in the Ordnance maps; that is the difference. This is an actual reproduction. It is very much the same as in the copyright of a book. One may use the information published in a book, but one may not actually reproduce it word for word. In the same way we use the information published by the Ordnance Department to make our map, but we do not reproduce it in facsimile.

1807. (*Mr. Mather.*) As Johnston has done?—Yes.

1808. (*Mr. Roby.*) Although colouring is added afterwards?—Yes, it is very much the same case as the copyright of a book.

1809. (*Chairman.*) In practice would that not be very difficult to distinguish. In Johnston's map, I take it, there is no alteration even of a single name?—It is a reproduction. They have really no title to call it Johnston's map, because it is not their map in any sense.

1810. You have added a very considerable number of names?—Yes, but not only that; this is, as it were, an entirely new map prepared from the Ordnance map.

1811. (*Sir A. Geikie.*) A great many of the names in the Ordnance map are left out?—There is a judicious selection made for a definite purpose.

1812. (*Mr. Brickdale.*) And a re-survey over many parts where it is out of date?—Yes.

1813. (*Mr. Mather.*) But you use the Ordnance Survey as the ground of your map?—Yes; but that is quite as permissible as using the information in a book, but yet not reproducing the book.

1814. (*Chairman.*) Crutchley would fall under the same denomination?—Crutchley is the same as our case. It is a new map engraved partly from the Survey information.

1815. Have not you some connexion with the Belgian maps?—No.

1816. Not with the Belgian Survey?—Not at all.

1817. Have you any connexion with foreign map publications—Government publications?—Not Government publications except simply the engraving of a geological map for the Belgian Government one or two years ago—merely the engraving of the map. We did that through our connexion with several Belgian publishing houses. We have prepared school atlases for sale in Belgium.

1818. (*Mr. Roby.*) I suppose you have been in the habit of using foreign maps for school maps?—Yes, we use foreign surveys for drawing up our atlas maps.

1819. (*Chairman.*) How do the foreign surveys and map publications compare with ours in your opinion?—I think that as to execution ours are almost as good as any of the foreign surveys. Only in Germany, I understand, they keep their survey up to date. If one applies to the German Survey Office for any special proof it can always be had up to date.

1820. That is a very small-scale map?—Yes; corresponding very much to our 1-inch map.

1821. Do you know any other country which produces their 1-inch map approximately from their cadastral survey?—I cannot say definitely.

1822. Probably the production of the small-scale maps from the cadastral survey delays both publication and revision?—I do not see that it necessarily does so.

1823. The revision of a 25-inch map or a 6-inch map would require much more detailed examination than

*Mr. J. G.
Bartholomew.*
—
24 May 1892.

Mr. J. G.
Bartholomew.

24 May 1892.

the revision of a 1-inch map?—Oh, yes; as to revision, I should say that the revision ought not to be dependent on the cadastral survey; but the production naturally would. The original production and the revision ought to be independent, I think, in order to facilitate rapid publication.

1824. Do you know if the foreign maps have been produced from the cadastral survey?—I cannot say as to that.

1825. (Sir A. Geikie.) Then I understand you to say that in your opinion, so far as your experience goes, there are no foreign surveys in which the maps either for accuracy or for execution are superior to our own?—In some instances for special purposes there are; but generally speaking, I think that our survey is quite as satisfactory as any that I know.

1826. (Chairman.) The French began to produce their small scale map—the *carte vicinale*—about 1876 I understand?—I think before that date.

1827. Their 1-inch map is nearly completed; at least their small-scale map—the *carte vicinale*?—Yes; I think so.

1828. And has been revised over a portion of it?—I do not know how far it is up to date; but they date them, I think, according to the date of revision.

1829. Do you know why they should have got on so much more rapidly than we have?—Well, in the case of the *carte vicinale* it is easy to understand, because they employ Erhard, and I suppose they naturally stipulate that the work must be done in a certain time. They let contracts for the work, and Erhard has to provide the necessary staff, and get it done in the required time.

1830. You think if the preparing of the materials were done by the Ordnance Survey, and the publication were put out to contract, we should get our map more rapidly?—I think so, decidedly.

1831. Would gentlemen in your position be prepared to enter into contracts for it?—Well; it could not be done just immediately, because the work is of such a special nature that we could not at a short notice arrange for the necessary staff. At present our staff is only large enough to carry out our own work.

1832. Do you think there are greater facilities in France for supplying contractors than there are in England?—Well, no; I would not say that.

1833. (Sir A. Geikie.) And do you imagine it would be a more costly, or a less costly, proceeding if such methods of reproduction as that were introduced?—I should think it would be less costly.

1834. To let out the engraving of the maps to contractors would be less costly?—I think less costly.

1835. (Chairman.) With regard to process, do you think the photo-zincographic process better than the lithographic process, or not so good?—I have had no actual experience of photo-zincography, because it does not suit our class of work so well. We either engrave our maps on copper or lithograph them on stone.

1836. (Mr. Roby.) Do you keep those stones for a long while?—No, we keep transfers on zinc plates.

1837. (Lieut.-Gen. Cooke.) And then re-transfer to stone?—And then re-transfer to stone. In many cases we do them direct on the zinc plates and transfer them to stone for printing; in some cases we print direct from the zinc plates.

1838. Do not you lose fineness by transferring to zinc and then re-transferring to stone?—To some extent, if the work is minute, but in some cases there is no noticeable difference.

1839. (Chairman.) These maps of yours that we have been looking at have been engraved on copper?—Yes, engraved on copper and transferred direct to stone.

1840. (Mr. Mather.) Do you consider that work superior to the work we have here?—The copper engraving is undoubtedly superior.

1841. But taking the zincographs from the Ordnance Survey Department, are they inferior to what you produce by that process?—Inferior to the engraving.

1842. Inferior to that process, but are they inferior to the lithographic process you employ?—I should say very much about the same.

1843. You do not claim for yours any superiority in finish?—Not at all.

1844. (Lieut.-Gen. Cooke.) Do you consider you can get as good work from zinc as you can from stone—as fine work?—No; I do not consider so. I think we get much better work from stone. I have not had much experience of zinc; but our experience was such to begin with that we do not use zinc to any extent.

1845. (Chairman.) Have you seen the new zincographic 1-inch maps of England?—Yes, I have.

1846. There is the engraved map, and there is the advanced edition by zincography. Are you satisfied with that?—I do not think that this (zincograph) is really desirable. I should think that by delaying the publication for a month or so you might have had this engraved—there is not so much engraving on this sheet, I should say with good engravers a map like this could be produced in a month or two, and it would be worth while waiting for the engraved plate. I cannot say exactly how long this (the engraving) would take to produce, but it would, I should think, only take, say, perhaps a month longer to produce an engraving of this than to produce a lithograph of it; therefore, the expense of the lithograph might be saved.

1847. (Mr. Roby.) Is not the expense of the engraving considerable in comparison with the expense of putting it on stone or zinc?—Yes; it is perhaps about three times the expense of the lithographic work.

1848. (Chairman.) Each sheet you say would be delayed about a month by the engraving?—A sheet like this (Barnstaple) without alterations; alterations are very troublesome. And then, again, if rapidity of production were a great object we would engrave this in two plates or in four plates, and in fact by subdivision you could get the whole thing done in a week if necessary. It would, in fact, be quite possible to produce copies of this sheet as well engraved as this one here (Bath) in a fortnight, merely by sub-dividing it into so many plates, joining the transfers and printing from the stone.

1849. Supposing you had half England or a quarter of England ready surveyed and drawn and you wanted to publish, would you think it desirable in order to hasten the work to adopt the zincographic process?—Not for the 1-inch. I should say that the 1-inch ought throughout to be engraved on copper.

1850. (Lieut.-Gen. Cooke.) In making your remarks you are aware that in this process of photo-zincography it is not engraved on zinc?—Yes. I see that the lettering is from type. I suppose it (Barnstaple) is prepared on a larger scale and then reduced to the 1-inch scale.

1851. (Mr. Roby.) If the map were engraved in the way you speak of and then the transfers put together upon stone, should you get as good a looking map from the stone as this copper engraving?—Oh, yes; quite as good. The difference would not be noticed if properly done.

1852. What would be your opinion supposing there were hill-shading?—Hill-shading cannot be hurried. It is so much more difficult to get competent hill engravers, that one cannot estimate that work.

1853. (Sir A. Geikie.) You could not sub-divide a whole sheet into sections?—They could be fitted together perfectly, and we could print on the top of them.

1854. (Chairman.) As an engraved map, is that (Bath) satisfactory to your eye?—That is a beautiful piece of engraving.

1855. As good as the old 1-inch?—Yes, better than the old 1-inch; but some years ago, I think the engraving was better than it is now.

1856. The execution?—The execution, yes, although this is a beautiful piece of work.

1857. In what particulars has it fallen off?—It seems to me to have fallen off in regard to the lettering, and perhaps the work generally is rather coarser; it is not so noticeable in the 1-inch as in the larger scales.

1858. I am asking you about that particular sheet. Continue your criticisms to that particular sheet, as to whether that is satisfactory as a specimen of the engraving of the 1-inch map?—I think there is scarcely any improvement that could be desired in this.

1859. Is the quality of the roads sufficiently distinguished?—Not quite. I should say that the shadow-line on the main roads is not effective enough.

1860. (Sir A. Geikie.) Do you suppose that this falling off in the character and the style of the engraving is due to any direction from the head office, or is it

simply a question of the manipulative skill of the engravers?—There is no very noticeable falling off in this sheet (Bath); but in all engraving work—in our own work—there is not the same beautiful engraving produced now that was produced about 30 or 40 years ago.

1861. (*Chairman.*) You think the engraving of some of the old 1-inch maps is better than the specimen before you?—The actual engraving I think better, although the drawing here is clearer and the style better, but the actual engraving of the older maps is better.

1862. I am asking you to give us the benefit of your criticisms on the latest specimens that the Ordnance Survey produce purely now from the expert's view of the case?—Well, quoting my father's opinion, he thinks there is a decided falling off in the actual engraving.

1863. (*Lieut.-Gen. Cooke.*) Of the 1-inch as well as the 6-inch?—I do not specially refer to the Ordnance, but to the engraving of all maps throughout the country.

1864. (*Mr. Mather.*) The skill of the engraver is not so great as it was years ago?—No, perhaps that is partly attributable to the fact that the plates about 40 years ago were mostly steel, and gave more beautiful work than the soft copper-plates now used.

1865. (*Chairman.*) Woods, houses, and parks are they satisfactorily distinguished (in the Bath plate)?—This, to my mind, is generally quite satisfactory for the uses of the 1-inch.

1866. You mean to say the plate is quite satisfactory?—Yes.

1867. (*Mr. Mather.*) May we take it that you would pursue the further publication of the Ordnance map by the process of engraving and transference to stone rather than by the present process of zincography?—Yes, decidedly. I think the 1-inch ought all to be engraved on copper.

1868. You think photo-zincography as an expedient may give satisfaction for a time?—It is simply doing the work twice.

1869. It has been done simply on the ground of expedition?—Yes, but I think it would be well worth while waiting a month, or even longer, to have it from copper.

1870. The intention is to have the second issue or the further issue entirely from copper-plates?—That is well.

1871. (*Mr. Roby.*) It is not a case of a month, I think, but a case of something like two years taken over the whole series?—I think that is quite unnecessary.

1872. (*Chairman.*) Quite an unnecessary delay, two years?—Yes, I think so. I should say it would be better for general purposes to print from the stone.

1873. As regards the paper, would you have thicker or thinner paper?—I should have it issued on different papers, as in the case of the French survey. For many purposes this drawing paper is the best paper, but for the tourist is unnecessarily thick.

1874. You would advocate the publication of the maps on several classes of paper?—On several classes of paper. I should say it ought to be printed on a thin Manila paper like the *carte vicinale*. With that Manila paper it is not necessary to mount it on cloth, it is so tough.

1875. (*Mr. Brickdale.*) Does not that Manila paper crack when it has been folded a great many times?—No, not Manila paper; it is tougher than any other paper.

1876. (*Lieut.-Gen. Cooke.*) The objection to that very thin paper is that if you wanted to scratch out or make additions it could not be done?—The maps ought also always to be issued on thick drawing-paper; but for general public use they would be more convenient on the thinner paper.

1877. You would have it issued on both?—Yes, certainly.

1878. (*Mr. Roby.*) What paper is this that you use. Is it similar to the French?—Not exactly, but my general opinion is that the Government ought not to constitute themselves, as it were, map publishers, and that although they should continue to print maps for official reference in this style (Bath), yet if it is thought

desirable that the map should be used by the general public, then they should arrange with private firms for its production in the various styles deemed desirable.

1879. (*Chairman.*) Subject to a royalty, the map should be produced in a series of forms by private publishers?—Yes.

1880. (*Lieut.-Gen. Cooke.*) But would you not have the Government publish from the original?—Yes, always, and supposing the district surveyors had kept the map up to date, that would be a guarantee that the map was the latest. The Government would perhaps charge more, but one would always be able to have on application a proof from the plate up to date with the very latest additions, even corrected every month. The corrections could be done as they were sent in by the staff.

1881. (*Chairman.*) The 1-inch map should be corrected up to within one month?—It might quite well be arranged so. It would be quite as easily corrected monthly as yearly, and no stock of proofs would be kept, but just printed as required. With regard to the transfers given to private firms they would naturally print off an edition, and there would not be the guarantee that it was revised up to date of sale; it would be printed off for popular use in colour-printing and published in a suitable style.

1882. (*Mr. Mather.*) And all from copper engraving, I suppose?—All from the plates prepared at the Survey Office.

1883. Copper plates?—Yes, for the 1-inch that is. For the larger scales I should say that copper was quite unnecessary; that it would be pure extravagance to engrave them on copper. I should think if they were all zinc they would be quite as satisfactory.

1884. Have you any other suggestions to make?—For the larger scales, I think that photo-lithographic reproduction of the drawings would be the simplest method of producing them for publication, and would be satisfactory.

1885. (*Mr. Roby.*) That is what is done now, I think. (*Chairman.*) Better than the photo-zincography?—No, that is really the same.

1886. That is universally the case now?—Except where copper-plates exist. It might always be arranged with private firms or with local surveyors to correct the 6-inch scale. Every year, for instance, we correct plans of Glasgow, Dundee, Edinburgh, Paisley, London; we bring these up to date every year for publication in Directories.

1887. (*Chairman.*) That is on the 12-inch scale?—The 6-inch scale. Now, if we had a certain amount of assistance, or if we were paid for the work that we did we could do it sufficiently exactly to suit all the demands of such a scale. We do not do it with very great minuteness, but we do it sufficiently correct for general uses; but with a little more expense we could make it, I might say, as accurate as the Survey.

1888. And carry it up to the 25-inch scale?—I mean on the 6-inch scale. We could keep the principal towns up to date then with very little more expense than we incur at present.

1889. You would rather suggest that the 6-inch maps should be kept correct and that the keeping of the 5-feet plans correct should be left to the municipal authorities?—Yes, I was simply referring to the general town plans. If there was some arrangement by which the duplication of the Survey work could be avoided.

1890. Six-inch maps of towns are produced from the 5-feet or the 10-feet according to which map happens to exist. You do not propose to correct the two large ones; you propose to correct always the small one—the 6-inch?—Yes; what we actually require to correct for annual publication.

1891. For the town map in fact not for the town plan?—Yes.

1892. You would suggest that it should be left to the municipal authority to bear the expense of correcting the town plan as distinct from the 6-inch scale town map—by the town plan, I mean the large scales?—Yes, I should think that would be desirable.

1893. I do not know whether there is anything else in your memoranda that you can suggest?—I think it would be well worth the consideration of the Survey, since the rapid production of the 1-inch is of so much consequence, to train up more engravers, I mean the

Mr. J. G. Bartholomew.

24 May 1892.

Mr. J. G.
Bartholomew.

24 May 1892.

desirability of having apprentice engravers. The staff of engravers could then be increased to a very great extent. I do not see how the Survey can expect to get a supply of engravers if it does not train them. It is too much to expect that a few private firms should train engravers for the production of the whole survey.

1894. (Mr. Mather.) We want to have the whole thing finished before there is time to train apprentices now. (Mr. Roby.) In what way do they attract your apprentices; is it by higher wages?—Higher wages, and the pension, always, is a great temptation.

1895. And is it regarded by certain men a distinction to be employed in the Ordnance Survey Department?—No, not that; but they rather imagine that they have an easier time.

1896. (Mr. Primrose.) You are aware they do not now get pensions. No man who has entered since the year 1870 gets a pension?—There has been rather a noticeable difference lately. I do not think we have recently had any engraver leaving us for the Survey.

1897. (Mr. Mather.) The service is now unpopular because the system of pensions has been abandoned, and one of the difficulties of the department appears to be that engravers cannot be induced to come?—But it would be a simple matter to train them.

1898. It takes a long time; it would take seven years?—Not necessarily seven years.

1899. (Mr. Primrose.) I think they do to a considerable extent train their own engravers now?—I was not aware of that until now. In connexion with the printing of the Survey I may mention that I should rather like to have permission to produce one of the 1-inch Survey sheets printed from the stone with the contour colouring in the style of our maps, and estimating for its production in that style.

1900. (Chairman.) You would want a transfer sheet sent to you?—Yes, a transfer of one of the sheets, and we would print it in colours and submit proofs, with an estimate so that you could judge of the comparative price; this would be the most practical form of evidence. If we had a transfer on the stone we could print it on a variety of different kinds of paper and in different colourings.

1901. What would you ask for the expense of the experiment?—Well, we would not ask more than the actual cost of the experiment and that would not be much. It would be a matter of a few pounds.

1902. Not 10l.?—It would be within 10l.

1903. (Sir A. Geikie.) I was going to ask you whether you were going to reproduce in colour such maps as you showed us in your own style or whether you propose to put contour lines?—I should prepare it in different forms at different prices and printed on different papers. If we were publishing it under Govern-

ment auspices, we should perhaps have two issues; one with the parishes coloured and one with contours coloured.

1904. (Mr. Roby.) What you are proposing now is not asking permission to do it and then publish it, but simply suggesting that if a transfer is given you would print it in different styles and tell us the respective costs?—Yes, it is simply as a matter of evidence.

1905. (Sir A. Geikie.) I think it would be most valuable evidence.

1906. (Sir A. Geikie.) Would you carry out the experiment on a hill-shaded or a contoured map?—On a contour map, as my aim would be a map for general use. I should almost prefer to deal altogether with the contoured maps, they are so much clearer. There is always more or less a difficulty in reading the lettering on hill-shaded maps.

1907. (Mr. Mather.) You would do some shading like you have on your own maps, following the lines of the contours?—I would print the water, the lakes, rivers, and seas in blue very much in the style of our own maps. The difficulty as to progress in the Ordnance Survey seems to be that when once a method is adopted they have not the same scope and freedom for making improvements even when they suggest themselves, whereas we would not be bound down in the same way. In every sheet that we issue we make some improvements in the method of printing and colouring.

1908. (Chairman.) Does that prevent one sheet of yours joining another sheet?—To a great extent it does, although we try to arrange them in groups as the district maps. As at present issued they would not all join and form a complete map; although we hope in a year or so to have them all uniform when we arrive at a satisfactory system of colouring.

1909. Then we will communicate with you on this matter?—Thank you.

1910. (Lieut.-Gen. Cooke.) I suppose we may say that you will undertake it without delay. I dare say it will take a long time to get money from the Treasury. Would you be willing to incur so much risk?—I would be pleased to do it whether the Treasury find the money or not. In the contoured sheets I have often thought it would be extremely interesting if the depths in the lakes were also contoured.

1911. (Chairman.) We shall have to ask the Director-General about that. We are told it belongs to the Hydrographical Department?—The Hydrographical Department do not interest themselves in our Scotch lakes at all.

1912. (Sir A. Geikie.) It is not salt water?—They have done Loch Lomond. I think that is the only freshwater lake which has been contoured.

The witness withdrew.

Mr. J. Wyld.

Mr. JAMES WYLD, Geographer to the Queen, called and examined.

1913. (Chairman.) Have you turned your attention to the large-scale maps of the Ordnance Survey?—I have to an extent.

1914. To the 25-inch scale, and to the town plans on a larger scale?—To some of the town plans.

1915. We will begin with the largest scale you are acquainted with. Are you acquainted with the 10-foot scales?—I may say that at my establishment we sell the whole of these maps. As you probably know, my father was one of the original agents before Mr. Stanford had the sole agency, and we have continued to sell all the Ordnance surveys from that time to this.

1916. Notwithstanding that you have now got to obtain them from Messrs. Stanford?—Yes. We consider that we sell, with the exception of Mr. Stanford, the largest number of Ordnance maps in England.

1917. (Mr. Roby.) Your father was a member of Parliament?—Member for Bodmin, and was a member of the former Committee on the Ordnance Survey.

1918. (Chairman.) Are the large town maps much in want of revision?—There are constant complaints by the public of inaccuracies both of detail and in printing.

1919. Is that arising from their being out of date, or original errors?—There are now and then cases.

1920. (Mr. Mather.) On what scale?—The large scale.

1921. (Chairman.) The 5-foot and 10-foot. London is 5-foot?—Yes.

1922. And the others you know of are on the 10-foot scale?—Yes.

1923. Some of the original errors were not so very important. They could of course be easily rectified?—There are a good many inaccuracies in printing owing to want of care in the printing.

1924. Errors in the line of frontages, or errors in the description?—The description, I think; I can hardly pledge my recollection as to that, but within my experience I have had several complaints as to description certainly. I cannot say I have had many, if any, as to frontage.

1925. As to the survey parts, they have been accurate? They have been fairly accurate.

1926. (Mr. Roby.) By description, do you mean the name given to it?—The name given to it, and the spelling of it; but the spelling of course is not of much importance. A spells it in one way and B in another, and as you know, sir, better than I do, the question of spelling was settled I believe by some process of

authority. I do not quite know how the Ordnance Survey did it, but I believe they consulted three or four people who were supposed to be authorities, and on that they based what they consider to be the right spelling.

1927. I suppose those town plans are better on the whole than any private plans or local plans that you have ever seen?—That is a difficult question to answer. I myself have just completed a survey of the whole of the parish of Fulham.

1928. On what scale?—5 feet to the mile. I do not say it with any impertinence, but I consider that that survey is better than the Government survey.

1929. Why did you find it necessary to make a 5-foot survey of Fulham?—It was required for a purpose.

1930. Had you a 5-foot scale at Fulham?—I think so, yes.

1931. And you could not make use of it?—I used it to an extent.

1932. And the 25-inch scale, was not that useful?—That was useful of course. Every plan is useful as a matter of consultation, no doubt.

1933. There is a 6-inch map of Fulham, a Government map?—That is so.

1934. But it was all out of date?—You see the parish of Fulham comprises a district which is immensely growing at the present moment, and which has in the last 10 years been absolutely altered in its configuration. The extension of buildings in Earl's Court and that district has been very, very large, and there has been no revision, as I understand it, for several years. It was not done on the part of the Government. It was required for a purpose and I have done it at my own expense.

1935. Were you in communication with the local authority, which I think is the local board there?—I was in communication with them.

1936. (Mr. Bobby.) May I ask what was your survey. Did you send your surveyors?—An actual survey.

1937. Or did you take the Ordnance map?—It was an actual survey.

1938. (Sir A. Geikie.) And totally re-surveyed afresh?—I re-surveyed the whole district that I took.

1939. (Mr. Mather.) In what way did you use the 25-inch map or the 6-inch map of the Ordnance Survey?—For the purpose of correction afterwards. For instance, my surveyor might bring in a sheet to-night, and I would run over it. Perhaps there might be a little piece in a corner only, and the rest of the map would have to be filled in, and I would see whether the Ordnance Survey was approximately accurate. In many cases it is not so, because the houses had been pulled down and other houses have been built in their place; consequently that corner of the Ordnance Survey would be no use to me.

1940. Then the fact is, you do not use these Ordnance Survey maps to help you to construct, but to show how incomplete they are?—I started by saying I did not use them for the purpose of construction, but for the purpose of comparison.

1941. (Chairman.) The triangulation was Ordnance triangulation?—Yes.

1942. And you took care that your detail went into their triangulation?—That is so.

1943. (Lieut.-Gen. Cooke.) When you talk of inaccuracies, you mean obsolescence?—Yes.

1944. Where there is something fresh to be put in?—Yes.

1945. That is not an inaccuracy of the survey?—There is no inaccuracy in the survey where no survey existed.

1946. I merely wanted to draw a distinction between inaccuracy and inaccuracy through obsolescence?—I do not say for a moment that the parish of Fulham, as it now exists on the Ordnance Survey, is inaccurate in the strict sense of the word, but it is inaccurate in not being up to date.

1947. What you said at first might lead the public to suppose that the original survey was inaccurately done?—That is not the intention of my answer.

1948. Do you think it would have been practicable for the local surveyor of Fulham, by entering on his Ordnance map every month the building plans that were sent in to him, to have kept his Ordnance map in such a condition as to make it a complete map?—Certainly not, because the building plans that are sent in, I find from experience, are very inaccurate, and it requires an immense amount of manipulation to get them all to fit into scale.

1949. Being drawn independently of the Ordnance map, they cannot be fitted into the Ordnance map?—Of course they can be by the manipulative skill of the draughtsman, but it is so expensive a business it is cheaper to send your man out to make a survey of the street than it is to dovetail the pieces in that come in from the builder or the draughtsman as they send them in to the local board.

1950. (Chairman.) If it was required for the building plans to be sent in on sheets of the Ordnance Survey, then it would be practicable?—Certainly, but then there is a difficulty about that, of course, on account of the scale.

1951. Is the scale of the Ordnance inadequate?—I should think for that purpose, yes.

1952. The 5-foot scale?—You see the builders send in plans with much more detail in them.

1953. (Lieut.-Gen. Cooke.) Would a larger scale than 10 feet be required?—I can hardly say. I do not know exactly what a builder would do. It is hardly within my province.

1954. (Mr. Mather.) But would you find any difficulty were you employed yourself by a local authority to keep up the Ordnance map of their district, say on a 10-foot scale, accurately yearly according to the development of their town?—It is the easiest matter possible. There is not the slightest difficulty. The only thing you have to do is, weekly or monthly, to send your surveyor to run over any new streets that are being made and ask the surveyor to give you information that in X street or Y street certain buildings have been erected. Then your surveyor takes the dimensions, and so on, and maps them down.

1955. In fact, to do it continuously would be a very small expense or trouble, but to do it after a lapse of two or three years would be a very large affair?—It would cost a great deal. In all these matters if things are kept up to date at the time there is little or no expense, but if you have to revise, for instance, a plate that has been in abeyance for five or six years the expense comes to be very great.

1956. (Chairman.) On these Ordnance maps the houses used to be shown blank?—They were.

1957. More recently they have been hatched, filled in with hatching?—Yes.

1958. As a substitute for colour, and it is a very much cheaper substitute; which do you think the best way?—Hatching, by all means.

1959. You would not publish the maps in skeleton?—No, filled in. For instance, if A comes in to purchase a sheet and one is filled in and the other is not filled in, he will take the one filled in.

1960-1. (Mr. Mather.) You would require the colouring in red instead of hatching to be of any value. Some of the Ordnance surveys are coloured red instead of being hatched. Do you think that is of any public utility?—I think it is a matter of very small moment. The point the public require to know is, whether it is a blank or not. If it is filled in with lines, I think it is very much better.

1962. This colouring gives rise to the employment of a large staff in the Department; do you think the public would be quite as well satisfied if they never saw the coloured maps—simply the hatched maps?—I think they would, but the public like pictures there is no doubt, and if a map is produced—I am speaking now purely commercially—if a map is produced artistically in the way of a pretty coloured picture, its chances of sale are very much better than if it is printed in black.

1963. You cannot make much of a picture of the block of a town?—It is a picture; there is a sheet of water; there are three colours.

1964. I speak more especially of the building blocks?—Yes; but you see there is a certain amount of artistic beauty about that (referring to a coloured sheet)

Mr. J. Wyld.

24 May 1902.

Mr. J. Wyld. which you would not get, of course, if it was simply hatched in.

24 May 1892.

1965. (*Mr. Roby.*) We have been informed that many persons object to the colour because it prevents their using such colours as they like of their own?—That is so; and that is an objection I have had placed before me personally. Architects and surveyors have said, "Do not send down coloured sheets if you can send plain." I think the balance is in favour of not having them coloured on the whole, and that the public would quite as well appreciate the map if it was only hatched in.

1966. (*Chairman.*) Colouring adds very much to the expense?—Colouring adds very much to the expense, and in my opinion it is a useless expense.

1967. And the hatching would add nothing to the expense?—It does.

1968. Not much?—It is infinitesimal compared with colouring, because the one is done by hand, and the other by quickly ruling.

1969. (*Lieut. Gen.-Cooke.*) Do not people object to the hatching on the same principle that they object to the colouring, that it prevents them putting in alterations?—The hatching is printed black. The colour has to be taken out by a chemical operation, and of course we have to scratch out the hatching.

1970. Is not that an objection?—Scratching out is an objection; but I think the objections are about equal. There is a difficulty. For instance chloride of lime is used for the purpose of taking out colour. After chloride of lime has been on the paper, it destroys the paper itself to the extent of making it rough for the purpose of writing on.

1971. (*Mr. Roby.*) When you have not got the plans hatched, they can be coloured or hatched according to requirement?—It is quite easy; for public purposes it is very much better to have the blocks so that the public can understand what the blocks are.

1972. (*Chairman.*) So that every map should be hatched, that is your opinion?—I do not go so far as to say every map.

1973. Would you publish the map in two forms, in skeleton and hatched?—That is a matter which involves at once the question of expense. If it does not matter whether the Government spends money or not, certainly yes; but if it is a matter of economy, if it is a question whether the Government should only spend a certain amount, I should say have only one map, and that hatched.

1974. I understand you would like to have two maps if possible; but if there is to be only one, you would have it in the hatched form; that is quite distinct?—Yes.

1975. (*Mr. Roby.*) Do you think that if the maps were only issued in the hatched form there would be any complaints?—I do not think the complaints would be heavier than at the present time.

1976. Do you think some of the public would wish for them not even hatched?—Yes, because architects require them occasionally for a special purpose, for the purpose of filling in; but I think they are infinitesimal compared with the bulk of the public.

1977. (*Chairman.*) I think that exhausts the large maps. We will pass to the smaller maps in which, I suppose, you have a larger interest than in the large maps?—Of course since the appointment of a sole agent we do not keep so large a stock as we did, and for this very good reason: the agent naturally desires to sell everything himself, and endeavours, if he possibly can, no doubt, to block others from selling. For instance, if A comes into my place of business and orders sheet, say, 324, and he meant 342, and I sent over to Stanford's, not having 324 in stock, Mr. Stanford will not change the 342, and of course that would be a sheet which is thrown upon my hands. If it is a saleable sheet it matters not; if it is an unsaleable sheet it will remain in stock for a considerable period, I having to find cash, absolutely cash, for the purpose of purchasing the sheet.

1978. I suppose there is great irregularity as regards the sale of the maps of different parts of England or Scotland?—Naturally, yes. For instance, the sale of the 1-inch survey of the home counties, by which I mean Middlesex, Surrey, and so on, is very, very large, but for maps of the extreme end of Cornwall there is a very slight demand, unless there is

something special. One of the difficulties I have to contend with is the difficulty arising out of the indexes. First of all, as to the catalogue, I do not know whether I may touch upon that or whether that is going beyond the scope of the inquiry.

1979. That is one of the things we have to go into?—The catalogue, in my experience, is a thing which is very much grumbled at by the public. The public say that the one which is published by the Department is far more difficult to understand than "Bradshaw," and although it is a most difficult thing to know how to suggest improvement in it, still certain improvements could be made so that the sheets could be more easily found on reference. Then the next thing is, that there ought to be separate indices. There ought to be an index to the 25-inch maps in counties; that is most important. To my mind, that is one of the most important features that the Ordnance Survey should direct its attention to. The public find a very great difficulty on reference in determining the locale of a particular place. I am speaking now of the 25-inch in counties.

1980. As regards separate indices let us finish that—separate indices to the 25-inch, to the 6-inch, and to the 1-inch?—Yes.

1981. Then in counties how would you keep each county separate, considering that the boundaries of the sheets run over other counties?—Take the present form of parish index. This is Yorkshire; this is what is issued now; this is what we would call the parish index. You asked me whether there should be separate indexes for each county, inasmuch as one county boundary runs over another. The map contains the county boundaries of the adjacent counties.

1982. The point in fact is, whether if I went to you I should ask you to give me the index for Yorkshire or whether I should say, "I want the north of England, about Yorkshire"?—I should think one of the public would come in and say, "Give me an index for Yorkshire, please." Then I should say, "Whereabouts?" Yorkshire being a very large county, he would say to me, "The region of York." We should know where it is and the shopman would find it in a minute, but one of the public could not. This is one of the difficulties. For instance, this may appear on another index of another county, and 108-14 Yorkshire in the index may be 103-17 in the next county.

1983. Is that so at present?—Yes, very often, and that is a source of extreme confusion. For instance, one of the public writes to us, and says "send me 108-14, Yorkshire, I want the sheet containing 'Knapton Common.'" This is on the edge of two counties, and is on sheets 108-10 Yorkshire, and 125-2 of the next county, which two sheets we send him. Had we sent him 108-14 Yorkshire it would have been wrong.

1984. (*Lieut.-Gen. Cooke.*) Why should he do this?—Because he has got hold of the index of the next county.

1985. (*Mr. Roby.*) Do I understand you that the same sheet is numbered differently in a map of one county from what it is in a map of another county?—Yes, entirely.

1986. The same sheet?—The same sheet.

1987. What I mean is this: supposing a bit of Lancashire came on here, would the same bit of ground on the edge of the Yorkshire map and on the edge of the Lancashire map be numbered differently in the two maps?—That is so; that frequently happens.

1988. (*Chairman.*) That arises from the different meridians that have been adopted and the filling up of the sheets which require filling up with a different meridian?—That is so, and that is one of the causes of the trouble, I have no doubt.

1989. What would you suggest to obviate that difficulty?—I would suggest that each county should have a separate index with the county boundary being the final line of the index. May I be permitted to show you this (Leicestershire)? Now the county boundary of this is Lincolnshire. This illustrates fully what I mean: that would be 8 N.W. Lincolnshire; 7 N.E. Leicestershire, and there is a little piece of Leicestershire in 8 N.W. Lincolnshire.

1990. If you sent for 8 N.W. Lincolnshire you would get that piece which fills up?—Yes. There is a very small piece there. He would send for that sheet, when in fact he wants this one.

1991. If he sent for that he would get that, it is quite certain; he would have to send for 8 N.W. P.—That is so.

1992. (*Mr. Mather.*) Then where is the confusion?—In 7 N.E. Leicestershire he would get that little piece of Lincolnshire.

1993. And he should not?—Certainly he ought, because the county boundary is within the division of the sheet. I think we shall find instances. For instance, that sheet is termed "8 N.W." Lincolnshire, and would be termed some other number under Leicestershire.

1994. (*Chairman.*) Your suggestion is that the index should be by counties; but that difficulty would always arise, would it not?—I do not think it would. If your index is for the whole of England and numbered throughout without reference to counties you would not get that confusion.

1995. As I take it, your suggestion would involve the re-numbering of the sheets, would it not?—No doubt it would. I am treating with matters as they are. If we want revision and revolution entirely that is quite another matter. Then I could make very humble suggestions which might be valuable as to how the sheets should be numbered from the commencement to the terminal numbering; but as I understood your question was for me to deal with the Ordnance Survey as it now stands and to point out any remedies that could be made.

1996. I quite see your difficulty. So long as you make your index by counties considering that the boundaries of counties are not rectangular lines, how can you avoid that difficulty in the numbering and getting into confusion on the edges of counties. For instance, as to that 8 N.W. Lincolnshire, Leicestershire necessarily has a different number when it comes to Lincolnshire?—Yes, but when the index was compiled and these numbers were placed upon the sheets it would have been the simplest thing in the world when they came to 8 N.W. Lincolnshire to call that 8 N.W. Leicestershire as well; it is the same sheet; instead of which they have given it a different number.

1997. That would involve the re-numbering of the sheets of England?—On the boundaries only; not in the interior.

1998. (*Mr. Roby.*) Your difficulty might be met by a tabular index showing the indents?—No doubt, and that is very easily compiled, without any difficulty.

1999. (*Mr. Mather.*) You want those indexes really to represent what they are on the face. You do not want any other description on the margin of the map; you want to be able to look on the face of the map or on the record number and see what they are?—If a customer writes, "Send me down an index for Yorkshire, I want it with Sherborne parish in it," I send this county boundary here; I do not want him to have confusion as to the sheet he requires.

2000. You would like to have the other number printed in the same space on the boundaries of the counties?—That is just what I was going to suggest as the remedy for the evil. In my humble opinion it can be very easily done either by a block or by a stamp on each sheet without going to very great expense. On every sheet that has a dual number—Lincolnshire and Leicestershire, for instance—the stamp should be put on—8 N.W. Lincolnshire, for instance—in addition to what it has already got printed on it.

2001. (*Chairman.*) Both on the sheet and in the index?—Yes, and it could be done at the most minimum expense. Of course, having a very large sale of Ordnance Survey maps, I have had to have very accurate indices made for the purpose of reference, because the public come to us and they require the sheet at once. When they come over to 11 and 12 Charing Cross they find we have a staff of men that can give them the information at once. We cannot give them the sheet very often because we have not it in stock, but I give them the information exactly as to what they want. I am obliged to have very careful indices all carefully arranged in volumes and so on. Now I have adopted the system of dual numbering of the blocks. As a matter of fact draughtsmen put the numbers on, and that is done for a few pence. That has saved hours and hours of labour to my Ordnance Survey men (the men in that department) in sorting out the orders of a morning.

2002. I suppose you find a good deal of difficulty through having the index to the 25-inch map and the

6-inch map on the same index?—That is so; that is a fruitful source of complaint by the public. Of course with most of my servants there is no difficulty, because they are trained to it and they understand it, but the outside general public do not grasp the difference between one figure and the other, and they do not often know what sheet they are ordering; they do not follow the scales. If I may be permitted to say so without disrespect to the British public, they require a vast amount of education in that respect.

2003. Is the outline map of England sufficiently correct with regard to outlines of the country to afford reliable information to a person like yourself?—With technical knowledge, yes. That map (Lancashire) I do not grumble so very much about. There is not much to complain about in that particular index.

2004. About Morecambe Bay there seems to be an irregularity?—I believe my people have called my attention to that. There are some errors there. I do not know what they are without referring to notes.

2005. (*Sir A. Geikie.*) You can hardly expect minute geographical accuracy in an index-map?—No.

2006. What you want is to show roughly the position of the place?—Yes, and the locus on particular sheets.

2007. (*Chairman.*) It would be very easy for the Ordnance Survey Department to publish a correct outline?—The simplest thing in the world; they have got all the material.

2008. Are there sufficient names printed in the index sheet to enable the public to find out what they want (a sheet was handed to the witness)?—I will take one county, the county of Northumberland. I do not think there are more than two or three names in that county. There is one name for Northumberland, and Berwick-on-Tweed and Newcastle-on-Tyne are mentioned. My first impression was right—there are three. I should say, taking Northumberland roughly as a county, that there are not sufficient names in that sheet.

2009. (*Lieut.-Gen. Cooke.*) You say there should be one name in every sheet?—You cannot have them if there are none. It may be that sheet 13 contains nothing but the smallest hamlet, therefore description must be used; but certainly towns of a certain number of inhabitants should be put in, provided you do not make your index so full of names that it becomes difficult to be read.

2010. (*Sir A. Geikie.*) Would it be enough, in your opinion, to put in the chief town of a sheet, and let the sheet be known by the name of that town?—I think that would be a very good plan; for instance, we might have the Reading sheet, and the Salisbury sheet, and so on.

2011. (*Chairman.*) Reading, or the principal town might be in the extreme angle of the sheet?—That is often the case.

2012. It might still be called the Reading sheet?—It might still be called the Reading sheet.

2013. (*Mr. Roby.*) Provided the names are legible, the number does not matter?—No.

2014. (*Mr. Mather.*) There are market towns in the county districts, only small, but still important?—It so happens that Reading is in the centre of the sheet. Now Stamford, for instance, is a very important town; Stamford is right up in the corner. It is not quite in the corner of the sheet, but it is right up in a corner.

2015. You would get as many towns on as you could without making it difficult to read?—I should advise that they have as many towns as could be read.

2016. The key to your map is a more readily understood key, is it not, the more towns you have?—Yes, but you see this is not for the benefit of the agents—if there were Ordnance Survey agents instead of being only one—but it is for the benefit of the public.

2017. There are maps in which going across from east to west, there is not a single town?—Yes, in Westmoreland and Durham. In Northumberland there is not a name the whole way across; from 37 to 44 there is not a single name.

2018. (*Chairman.*) I asked you that question for a particular reason, because it has always struck me that there is an insufficient number of names; we may take it that the 1-inch index requires more names and to have the boundary to some extent corrected?—The boundary is not important; it is only a coast line.

Mr. J. Wyld.

24 May 1892.

Mr. J. Wylde.
24 May 1892.

2019. Is the 6-inch index a satisfactory one, barring the point about the double lines?—There is a difficulty about this which I will draw attention to. It is this; I do not think that the printing in dual colours, such as black and red, is advantageous. It is said, that you see at once what your number is, and you see the division of each sheet. But when you have, as you have in this particular case of Leicestershire, a vast amount of smaller parishes, that is not always the case. Take, for example, here—that is very faint. If that was in black that would come up very much stronger upon that yellow ground than it does in its present form of red upon yellow.

2020. Considering that the parishes are coloured, it will be desirable that the index numbers should be black?—I will put it in this way, with your permission: if the index was printed in black only, without colour at all, it would be better to have the numbers of the sheets and the dividing lines of the sheets in black also.

2021. The whole of the map in black?—The whole of the map in black. That would be much more convenient.

2022. That would be much more convenient to the Ordnance Survey Department?—Very much more so; it would save the dual printing. It seems to me that very often the department in producing the Government maps go to a useless expense without obtaining adequate result. For instance, there are two printings here. Twice this has been over the stone—black and red. It has been on a black, then on a red stone; two printings which with one impression could have been done just as well, and they would have got exactly the same result. Now, these parishes are all coloured by hand, which is a very expensive process; it costs so many pence if done by female artists; if done by men, a great deal more.

2023. (Mr. Mather.) These are stencilled to a great extent by boys?—We do not do it in that way; we do them all by hand. For instance, if I have an index sent to me to be coloured, I should do it all by hand.

2024. You say that the index is so seldom used that once it is understood in black and white it is quite sufficient?—Quite sufficient.

2025. Would you propose to print each county separately for the index. Would you propose to take an impression of the county for the index quite separate from the adjoining county?—Certainly not.

2026. Only if the adjoining county laps over, and if that were printed only in black and white you would have a difficulty in indicating each parish. You would have the counties separate?—I would not have the boundaries of the counties as they are now.

2027. Would you for the index keep the boundaries coloured as they are now? How would you define the boundaries?—A good strong black line is quite sufficient. The point on my mind at this moment is to save expense to the Government, and produce the same thing, or a better thing for a less expense.

2028. (Chairman.) It is a great point that it should be more simple as well as more economical?—It is quite clear that if the 6-inch index were printed all in black it would be a saving in expenditure, and I think it would also be clearer.

2029. (Mr. Roby.) You prefer that the index should take the shape of a map than that of a table?—Yes, certainly; it is grasped so much quicker by the public. I was going to say—I do not know whether I did—that I would humbly suggest a separate index to the 6-inch maps.

2030. (Chairman.) Your principal suggestions are separate indices to the 25-inch, 6-inch, and 1-inch; and the indices should be all printed in black: and the same map should serve as an index both for the 6-inch and the 25-inch, the sheet lines only being changed on the map, 6-inch map lines for one index and 25-inch map lines for the other.

2031. (Mr. Mather.) You would have them all printed in black and white; no colouring on the indices?—I do not see the advantage of colour except in special cases.

2032. (Chairman.) Would you use that same map for the 25-inch, only taking out the 6-inch lines?—Yes, I think so; there is no necessity to have it duplicated.

2033. The same map, omitting the 6-inch lines, would do very well for the 25-inch?—Yes, certainly. If that is printed from stone it is done in a very few seconds, and by using acid to take off the stone the lines you want to eradicate, you have exactly what you want.

2034. With regard to town places is there any difficulty as to the indices in the large scales (a town plan index was handed to the witness)?—The index I have before me is that of Manchester and Salford. I do not myself know that I have had any complaints about the index to this particular place and I do not think there is very much to be grumbled about in this index. I think you may sum up as the result of my investigation that these indices are fairly good.

2035. The town index maps are fairly good?—Yes, you may take it that the town maps are fairly good. Of course, the public grumble about everything, and we do have occasional complaints, but they are not worthy of being given attention to.

2036. That covers all that you can give to us about indices?—I think so.

2037. Now about the quality of the 1-inch maps, have you anything to say?—As to the paper?

2038. No; general criticisms, paper included (a 1-inch map of Cambridgeshire was handed to the witness)?—These are all printed, I need not tell you, by the process of photo-zincography.

2039. I think that is an engraved one. What do say about the printing (a coloured map of Barnstable was handed to the witness)?—This is printed by the photo-zincographic process.

2040. Considering that that hastens the production of England by about two years, is it worth while to produce them in the photo-zincographic form?—I should certainly say it was, although you get a very inferior article here compared with the steel. I think it is a matter of extreme moment that the survey should be completed at the earliest possible moment.

2041. Considering that that map will be completed in the engraved form, but that it is for some districts rather an obsolete map, would it be worth while delaying the completion of the engraving until the map has been revised?—What is in my mind is that I care not by what means the result is obtained, but the result should be that the survey should be published as quickly as possible in some form or another.

2042. (Mr. Mather.) And correctly?—Correctly, naturally; it is no use giving the public an incorrect map.

2043. (Chairman.) Having produced the map of all England—part of it by photo-zincography—is it worth while reproducing this photo-zincograph in engraved form with corrections?—Certainly not, because the expense of engraving is so enormous.

2044. You would wait for the engraving until you had got the revised sheet?—Certainly, because you give to the public a fairly accurate zincographic map; still if you are going to engrave the map you certainly should wait until you have got your drawing perfect before you put the engraver to work.

2045. With regard to the detail of the map and the engraving, are you satisfied with that one-inch sheet of Cambridge?—As to the engraving (Cambridge), I say it is fairly good. Of course, modern engraving is nothing like so perfect as was engraving in the days of our grandfathers, because, first of all, we have not so good a staff of men and there is not so much attention given to engraving nowadays by reason of these new processes that have come into operation; but taking it all round the engraving of the plates is fairly good; the one that I have before me, for instance, this sheet of Cambridgeshire, is fairly well engraved. There are failures here and again, but they are not of any very great importance; for instance, some of the lines are not absolutely distinct enough, the engraver has failed to go sufficiently deep.

2046. He has not kept the same depth?—He has not kept the same depth. There is a want of uniformity which shows that he is not what we should call a masterhand. I should humbly think that in some of the sheets, especially to which I have had my attention drawn, the engravers have been, I will not say apprentices, but men who have been somewhat young at the business. They have not got the firmness of hand of the old engravers, men who have been in the business some 20, 30, or 40 years. Of course, I fully appreciate that the Government have the greatest difficulty (as I am informed) in getting engravers, because there is a very limited number. Of course, the trade engravers (the map trade) have a still greater difficulty in getting engravers, because the Government snap them up as soon as they have got

anything like well trained, and the engravers are only too happy to go to the Ordnance Department at Southampton. First of all they think they get better wages (I do not know whether they do or not); they think they get pensions, which they do not; and they think they can do exactly as they like, with nobody to supervise them or trouble them, while in a private establishment they have a superintendent foreman and a master. Now, in a Government department the mechanic imagines he is allowed to do exactly as he likes with the occasional supervision of a superior whom he may or may not see.

2047. (*Mr. Roby.*) Do not you think this want of sharpness of line may sometimes be due to the paper?—Yes, and that is a matter about which I can make a suggestion.

2048. (*Chairman.*) Before we go on to the paper, let us finish with the map itself. Are the roads sufficiently distinguished?—Of course the idea of the map cannot be altered now. When the Ordnance Survey was originally engraved, there might have been suggestions made which would have made the roads very much clearer. For instance a road here, with a fine line on the north side, and a very dark line on the south side, would have been very much better if the north line had been a trifle deeper and a trifle thicker. Technically we find that in the engraving of maps. For instance, I have just completed a map of the south-east district of England, from Norfolk straight away to Oxford, and then down to the Isle of Wight. It has taken me more than 18 months, nearly two years, to engrave this map. In all these roads I have graven a single line on the top, or right, or left, as the case may be, and that has very much beautified the map, and drawn the attention of the eye to the spot. Here you find when you look at the map you are not quite certain whether it is main road, bye-road, or cross-road, or what, till you look at it, especially as many people nowadays have to put their glasses on to see; the public do not want to have to put their glasses on to look at a map.

2049. The distinction between the first and second-class road is not sufficient?—No.

2050. On the old Ordnance map was it better?—Much better; indeed I venture to say that the old Ordnance Survey map with all its imperfections was very much better engraved than the present one.

2051. With regard to the number of names, I think there are not so many names on the old Ordnance map?—No.

2052. Have there been any complaints?—We have had complaints as to the omission of names, but of course I do not know what rule compilers of the map go by; there is no doubt there are a good many omissions which the public have complained about. To condense it, my own opinion is that a great many more names might have been usefully inserted than there have been, especially names of some of the more important farms.

2053. Isolated farms should be always named?—Isolated farms certainly should be.

2054. If there is room on the map?—There is always room on the map. In the map of Cambridgeshire which I have before me it is all fenland; therefore it is not a fair specimen. But take Bath; now, the first thing I notice is that there is a road here, and there is nearly a good square inch without a single name of any sort or kind upon it.

2055. There is a house apparently there?—Yes, but there is no name.

2056. There is a mill; there must be a name to that mill?—There must be a name to that mill; there must be a name to that house; there must be a name to that farm. There is a mile or a mile and a half without a single name. There are a lot of large farms in this country which I know. I have shot over this country myself, and there are a lot of farms not named.

2057. They are marked, I suppose, as houses?—There are none here.

2058. If we had the old sheet of the Ordnance we could see how far this sheet is deficient?—I wish I had brought one over. Every now and again there is a failure. I do not understand how that is, because we never have any failures in any engraved map unless there has been very deep cutting out for the purpose of alteration.

2059. (*Mr. Brickdale.*) What is the failure?—Assuming that road goes over there, that is a failure. I do not know if it so. The paper has not taken the ink.

2060. (*Chairman.*) Now shall we go to the paper?—The question of paper is a very important one; I will tell you why. Although the maps that are sold by the agent and sold by the Government are sold only in the sheet and never mounted, as I understand it, I may say that 60 to 75 per cent. of the maps that are sold by us are mounted in some form or other either for hanging on rollers or to roll up. One of the greatest difficulties we experience is that the paper is not of uniform thickness, of uniform quality, nor of uniform colour. The consequence is that in joining several sheets together you get a diversity of colour; you can never get them to join, and you get maps with main roads half an inch out in the centre, for instance, although the sheets are properly done.

2061. (*Mr. Roby.*) Is not that only when two counties are put together?—No.

2062. (*Sir A. Geikie.*) Are you speaking of any particular scale of map that you find an inch out?—Half an inch, three-quarters of an inch sometimes. It arises in this way: for the purpose of mounting the sheets have to be damped, often wetted, but certainly damped, because paste has to be put on the back of them for the purpose of making them adhere to the calico, and much depends on the quality of the paper, its texture and thickness—by texture I mean whether there is more rag in it and it is of a better quality or whether it has more straw in it. As to thickness you will find a great diversity of thickness when you come to put a thick and thin sheet together. For instance, supposing this has to be joined in the centre, that is one sheet and that is the other, this being very thick and this very much thinner, you will find the thick sheet will not stretch, but the thin sheet on the contrary will stretch, or *vice versa*, and you will get in your joins a difference of half an inch, a quarter of an inch, half a mile out nearly. By process of manipulation, very careful ironing, and getting the temperature of the sheet very high, and putting it under pressure (we mostly do it by hand), we stretch out one sheet so as to make them approximately join, but in 99 cases out of 100 we have the greatest difficulty in getting the sheets to join. I can bring to you without any difficulty several sheets which are good specimens which we have had returned by the public, they will not have them. We have sent to the agent and asked him to endeavour to see if he can furnish us with sheets.

2063. (*Mr. Roby.*) It is not that the drawing is wrong?—Only that the paper stretches unequally, due to variations in the quality and thickness of the paper.

2064. (*Chairman.*) Have you found that difficulty lately?—Yes; quite as much as ever.

2065. It does not arise from the difference between yellow and white sheets—because they have changed the paper from yellow to white?—I know they have.

2066. (*Mr. Mather.*) Have you had from different makers different qualities of paper even under the same order or description. I understand that the department have had considerable trouble from time to time with paper manufacturers?—One of the most important things is the question of colour caused by tinting. We frequently have now yellow and white, and shades of grey. There are four distinct shades, and the consequence is that you get four distinct colours, so that my colourers have to tint to one uniform shade, either of grey or yellow, to make the map look anything like passable, because, as you know, sir, after being sized and so on, the maps are frequently varnished; a great number of Ordnance maps are sold by us in the form of varnished maps for the purpose of hanging up in halls and so on. For instance, A has a country seat, and he desires to have a map of the country for 20 miles round. We supply him with so many sheets, having a one-mile radius, 20 miles round from his house, and he can see where he can drive. Perhaps that might run into four sheets. There will be a difference both in the thickness of the paper and the colour of the paper, and the quality of it, so much so that there will be a difficulty, and that will have to be coloured, and then it has to be ironed to get it to fit. If it will not fit, we have to try to do it by sizing; if we cannot do it then, we have to varnish it. If there is a want of uniformity in the colour, it shows up tenfold under the varnish. The consequence is, of course, that it is considered bad workmanship; but that is not the fault of the manu-

Mr. J. Wyle

24 May 1892

Mr. J. Wild.
24 May 1892.

facturer, but the fault of the Government in the supply of the paper; and I should humbly suggest that there should be for the 1-inch survey a uniform thickness of paper, double elephant, or whatever may be the particular kind of paper the Government may think proper to have, but it should be of uniform thickness.

2067. (*Chairman.*) Have you ever tried to obtain paper on a large scale which is uniform?—Yes; since my father's death I have purchased very large quantities of paper for a particular contract.

2068. Extending over several years?—I will not say that.

2069. Two or three years?—Yes, two or three. I buy perhaps differently from the Government. I buy, we will say, 40 reams. We will say there are 500 sheets, for example, in a ream—there are not that number or anything like; there may be or there may not be—we will say there are 500. I buy 40 reams. That paper does not depreciate in any shape or form by being kept. The edges may get dirty and the paper has to go under the guillotine to get the edges straight. I go through every ream and take out a centre sheet and compare it with the other ream (at least my foreman does, it is his duty to do so), and if we find there is a difference in tone that ream is immediately thrown out and we will not have it, and it is immediately sent back to the manufacturer. It is absolutely necessary that we should have uniformity of colour and we have it. In 40 reams there are about 20,000 sheets.

2070. You bought that at one stroke?—We bought it at one stroke from the same manufacturer—from the same mill. I do not say it was all from one class of rags, but it was probably all manufactured at about one time.

Adjourned until Thursday, May 26th, 1892.

Board of Agriculture, 3, St. James's Square, S.W.

SEVENTH DAY.

Thursday, May 26th, 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Lient.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.
Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Mr. E. G.
Wheler.

26 May 1892.

Mr. EDWARD GALTON WHEELER, Commissioner to the Duke of Northumberland, Alnwick, called in and examined.

2076. (*Chairman.*) You are Commissioner to the Duke of Northumberland?—I am.

2077. And have the management of large estates in that county?—Yes.

2078. And formerly in Cheshire?—Yes.

2079. And you have used these 25-inch maps?—Yes, very considerably.

2080. The map of Northumberland, the large 25-inch map, we are only talking of that, is now 30 to 35 years old as a survey?—Yes.

2081. Do you find it is accurate?—I find it is accurate, very accurate, as a survey, but of course it much needs alteration, especially in populous places.

2082. So far as delineation of physical objects is concerned, such as roads, fences, buildings, &c., you find it is excellent, and although you have made constant use of them for matters of detail you do not remember to have ever found an error worth mentioning?—That is so.

2071. You think as a buyer of paper that it is possible for the Government, buying every year, to secure the same class of paper every year?—Certainly, without the slightest difficulty whatever. Anybody who understands paper technically will tell you there is not the slightest difficulty in getting uniformity of thickness and uniformity of colour.

2072. (*Mr. Roby.*) Would you say you are in favour of maps being on thicker or thinner paper?—I have had a good many suggestions made to me about thicker and thinner papers, but I am not in favour of thin paper except for some special purpose. Ninety per cent. of the British public want the Ordnance maps for the purpose of making alterations upon, for writing on, or something of that sort. It is absolutely impossible on thin paper to scratch out and make alterations, and if you do write on thin paper it goes right through.

2073. Mr. Bartholomew said he would like the 1-inch map published both on thick and thin paper; would you agree?—No; 99 per cent. of the public who use Ordnance maps use them to write on or scratch out on. It would be impossible to write on thin paper like that (Mailla paper). It is very good for certain purposes. In my foreign business, for the transmission of maps abroad and so on, I use it a great deal.

2074. (*Mr. Roby.*) The paper we are thinking of is such as the French maps are printed on?—The question is whether the demand would be sufficient. It is all very well for mounting purposes, for that it would be very, very useful, but that only applies to a few.

2075. I suppose in thin paper there would not be quite the same variation, would there?—I do not know. I think it probable there would be more. It is a very difficult thing to mount very thin paper of this texture (the Mailla paper).

2083. You think their value in this respect is only now beginning to be generally appreciated?—I am speaking of coarse country districts. I think their value is still gradually growing upon the public.

2084. And the general public are hardly acquainted with them?—No, I think not; insufficiently so.

2085. You think that is owing to their not being popularly sold, particularly in the towns?—I do.

2086. For accuracy of boundary you have never hesitated to accept them as correct?—I have not.

2087. You refer to fences and so on?—Yes, I do.

2088. (*Lient.-Gen. Cooke.*) For accuracy of detail?—Yes, as regards detail of survey.

2089. (*Chairman.*) Has the Land Office accepted them as authoritative?—There was a difficulty about it in one case some five years ago in which I was concerned.

2090. They doubted the correctness?—They preferred the old tithe map.

2091. Do you know at all why they preferred the old tithe map?—No, I do not.

2092. Is it your experience that the old tithe maps are correct?—My experience is very much the reverse. Perhaps I ought to say that they vary very much in accuracy.

2093. You think some improvements might be made in the character of these Ordnance maps?—Yes, I do.

2094. Would you mention what those improvements might be?—One universal type appears to me to need adoption. There is too much diversity, arising probably from attempts from time to time at improvements on the earlier surveys, which has led to much inconvenience to the public.

2095. (*Sir A. Geikie.*) You would not prevent the Ordnance Survey from adopting any improvements which experience taught them were useful?—Certainly not; only that, in my opinion, the maps should always be, as far as possible, of one particular type, one standard map for the country. For instance, one sheet has areas shown, while the other has not; one has reference books and another has not.

2096. Would you kindly make a little clearer what you mean by type, so that we may understand what you object to in change?—In the 1-inch maps, for instance, in one issue the hills are shown shaded; in the next they are shown by contour lines. You may buy two sheets adjoining, and you receive two different maps in return.

2097. Excuse me, but those are two editions of the same map; you can get the hill-shaded maps or the unhill-shaded maps if you wish?—It is quite true, but if you order them from the country stationer, and the wrong map is sent down, they decline to take them back again.

2098. That is not exactly a difference of style, that is a difference of commercial arrangement?—Yes, but the general public never know which map they will get unless they are acquainted with all the different kinds.

2099. (*Chairman.*) Because they would not know how to describe it?—Yes.

2100. There are various forms of the 25-inch. What various forms have you met with?—The forms I have mentioned, some giving areas some giving none; some having area books and some without them.

2101. That is really two types?—Yes.

2102. The one that has not the area printed on it has an area book, and the one that has areas printed on it has not a book?—In some cases there are area books where the areas are also shown on the maps.

2103. Which of those two do you prefer?—I certainly prefer the area book; I do not say I object to the areas on the map but I think the area book is the most useful.

2104. (*Sir A. Geikie.*) Do you mean that this change of type has been introduced into, we will say, the same county?—Yes. I have here two adjoining sheets recently purchased at Alnwick. The one sheet has the area shown on it; the other sheet has not. These are two maps purchased at the same time for the same purpose.

2105. Do you happen to know the difference in date of publication?—No, I do not. They were purchased, I believe, at the same time, and at any rate within the last two years.

2106. (*Chairman.*) You find that on the sheets where the areas are marked occasionally the fields which are cut into by the boundary of the sheet have not got the areas marked?—I do.

2107. Do you know how that has occurred?—I see it is mentioned in the margin of the map, that it occurs owing to the survey having been incomplete at the time.

2108. That is so stated on the sheet?—Yes, but it is a point I wished left out of this evidence; I struck it out.

2109. I think it is just as well we should have this on the evidence for the information of the public. I was aware you were acquainted with it.

2110. (*Mr. Mather.*) That is, the older maps are without areas and the newer maps have the areas marked on them, because this is a more recent survey?—I believed it to be so until I saw these 25-inch Northumberland maps with the areas marked on them, which is a fresh edition.

2111. (*Chairman.*) Why do you prefer the area book?—It gives the details of the township. It is easier to make schedules of estates on account of having the fields following each other in the form of a schedule, and it gives other information which is very useful in the matter of the marks on the map, which however might be further improved, and it gives a very useful table for converting rods and perches into decimals for the use of the public.

2112. But is it easier to compile a schedule from the old area book, considering that all the numbers are consecutive, that is to say, 696 followed by 697. Does it follow that these numbers are contiguous or part of the same estate?—It does not follow, but it is of very great assistance as many of them are.

2113. For instance, in compiling the schedule of a farm you do not want to include the coppices of the farm?—Not generally.

2114. And yet the numbers belonging to those two items would be in the middle of the schedule, which you say is a consecutive schedule?—It is quite true, but if you can take a series of consecutive numbers which are included you can add them up much quicker than you can pick them out field by field from the various sheets.

2115. Is it easier to sit down with your estate map before you of the farm which you are letting and write off the numbers of the fields from the areas until you have got your schedule complete and then add them up?—I have not had an opportunity of dealing with these maps that had the numbers on them, but I can only say that the area books are most useful in the way I have indicated.

2116. (*Mr. Mather.*) You would probably like both done. You would like the maps marked and the area book as well?—Yes, I should like both done.

2117. (*Chairman.*) If the plan of the area book is adopted the fields then are necessarily numbered?—I do not quite follow.

2118. If area books are published then the fields shown on the 25-inch map are necessarily numbered?—Yes.

2119. Suppose there is any change of boundaries or parishes it necessitates renumbering; the whole of the area becomes wrong and the whole of the references become wrong in future?—As do the maps themselves.

2120. No, the maps themselves would still be correct unless the natural features were altered. A change of parish boundary would not alter the plan except as regards the accuracy of the parish boundary?—It would alter the area of the plan.

2121. It would alter the area of the parish?—Yes, and therefore of course it would alter the area books as well as the parish area given on the maps.

2122. But as a permanent reference could you trust to enumerating an estate by the numbers in the area book, considering that the numbers in the area book must have been changed by any change of boundaries that may happen to be made?—It appears to me that the accuracy of the area books and the accuracy of the maps practically go hand in hand. If one needs correction the other needs correction.

2123. But you would lose the permanency of reference?—If your parish boundaries were once authoritatively settled, which is a matter which I think is much desired, your area books would be settled for all future, would they not?—They would need revision from time to time as the fences of enclosures were altered.

2124. But at this present time, especially since 1882, there have been very large alterations of parish boundaries owing to the Divided Parishes Act?—Yes.

2125. In every one of those cases the whole of the original numbering of the Ordnance maps has been destroyed?—I suppose so.

2126. And the area books have become incorrect, and references to the maps and their numbering in legal documents have become obsolete and misleading?—Yes.

2127. Does not that indicate that it is a defect in a national map to indicate by parish numbers, which may be changeable, the particular plots of ground referred to?—It is rather difficult for me to say from the national point of view, but from the point of view of public utility I should certainly say that if area books

Mr. E. G. Wheeler.

26 May 1892.

Mr. F. G.
Wheler.
26 May 1892.

or the numbering of fields are discontinued it would be a great loss.

2128. (*Mr. Roby.*) Have you had many alterations of parish boundaries in your part of the country?—No, since I have been there.

2129. (*Chairman.*) Instead of numbering by parishes would it answer to number by the sheet?—I have not thought that question, over before. I see no objection to it.

2130. So that the numbers should be consecutive for the sheet, notwithstanding that they might be in two parishes?—Yes, I see no objection to that.

2131. And that would get rid of the difficulty of having to change all the numbers in the event of a change of boundaries?—Yes.

2132. (*Mr. Roby.*) You have not found any great difficulty from the plots being numbered in your part of the country have you?—In what way do you mean—confusion or what?

2133. Yes, in confusion?—No; I do not think so. I think the numbers are confusing at times. On this map of Alnwick there is an instance in point. One field in it shows many numbers to small plantations which were not enclosed at the time, and have not been enclosed since.

2134. (*Sir A. Geikie.*) I should like to ask you whether you do not think for other purposes it is a very great advantage to have all the information relative to the fields on the map itself?—Yes, I think it is.

2135. (*Chairman.*) Do you approve of showing hedgerow timber?—No, I do not.

2136. Do you approve of isolated trees being shown?—Where they are landmarks or important, not otherwise.

2137. In very rare cases?—In comparatively rare cases.

2138. You would put in trees?—Yes, as regards showing plantations.

2139. That shows the character of the map; that is conventional?—Yes.

2140. You think perhaps the trees that are now shown are overdone?—I do, decidedly.

2141. (*Mr. Roby.*) Do you know from looking at the map generally whether a tree is meant to be a conventional indication of trees generally, or whether it is meant to be a mark of a particular tree?—No, I should not know.

2142. (*Chairman.*) Might not it be desirable to have a different stamp for what I would call a real tree?—Possibly it might.

2143. Would you leave them out altogether?—I should leave them out altogether, except in the cases I have mentioned.

2144. (*Mr. Roby.*) Have you in your part of the country in many cases trees which are well known as marks in the district?—There are some trees which should certainly be shown on the map—trees of interest from some reason or other.

2145. (*Mr. Mather.*) Take avenues of trees along the main roads; would you not show those on the map?—I think it is quite immaterial.

2146. What harm does it do?—It is confusing, I think.

2147. (*Chairman.*) You also object as a surveyor to hedgerow timber being marked?—Yes, I do certainly, and especially in crowded places such as villages.

2148. And that is a common objection among surveyors?—I believe so.

2149. (*Mr. Mather.*) Is that because the map is confused thereby?—Yes.

2150. Solely on that ground?—Yes, and also because I think it interferes with the permanent accuracy of the maps, showing trees that may be cut down at any time.

2151. Trees of a certain number of years' growth are permanent land marks, are they not?—No, I think not. Perhaps a man has a fall of timber, and the trees come down.

2152. A fall of the heavy timber, but not light timber?—Old trees.

2153. (*Chairman.*) In 1882 there was a discussion at the Surveyors' Institute. I do not know whether you took any part in that?—No, sir, I did not.

2154. And the president, in summing up the discussion upon Ordnance surveys, observed upon the whole the balance of opinion seemed to be in favour of the omission of hedgerow timber?—I had forgotten that statement.

2155. (*Mr. Mather.*) In many parts of England we have, perhaps, half-a-mile of very fine timber along the road, in the hedgerows, making a shade over the road?—They would rather come within the definition of marks.

2156. You would have those trees in?—Yes, in the conventional manner above suggested.

2157. (*Chairman.*) But you complain rather of the minute delineation of the trees in the present maps. Wherever a tree has occurred it is put down, whether it is part of a long avenue or a wood?—Yes.

2158. You object to these small isolated trees being shown?—Yes.

2159. (*Lieut.-Gen. Cooke.*) I should like to ask one more question about the trees. I imagine one of your principal objections to showing trees is that when you want to make alterations on the map, to add on a building or plot out the building, or anything of that sort, if there happened to be a great number of trees on the place it would rather interfere with your alteration of the map would it not?—Certainly it would.

2160. That is one of your strong objections?—Yes, it is.

2161. (*Witness continuing.*) I might mention perhaps in connexion with the trees that the numbers given in woods are sometimes difficult to find.

2162. Because they have not sufficient open space in stamping, to put the number in?—That is so.

2163. (*Chairman.*) With regard to the bracing of small plots I think you have some observations to make?—A great difficulty arises in identifying plots intended to be included under one number, especially in populous places.

2164. In a village you necessarily get a mixture of properties?—Yes.

2165. Would it be practicable to show on the map, in some other way, the areas of these smaller divisions?—I cannot answer that question. It is very desirable if it is practicable.

2166. Would it be possible by lettering the braced plots and carrying the letters into an adjacent open space to give the smaller areas which are braced?—I am afraid it might have the effect of somewhat confusing the map.

2167. It would be a convenience if it could be done without confusing the map?—Yes, I think it would. Possibly the lettering might be carried out in the margin of the map.

2168. That would be too far away from the plots?—Yes, perhaps it would.

2169. (*Mr. Roby.*) One other point. Do you think it is of any importance to put the details of the gardens or other ornamental pieces of land adjoining houses?—I think it is unnecessary.

2170. You think it would be enough in the case of a garden to show simply the area and the boundary lines without going into detail?—I do.

2171. (*Mr. Mather.*) Unnecessary from the point of view of a surveyor or agent?—I am only speaking from that point of view.

2172. Because we have had evidence that many of the public are not satisfied even with the amount of detail shown?—Really!

2173. (*Mr. Roby.*) I am only dealing with the 25-inch, which I take it is not a map for the public, but it is only for parish purposes?—Yes.

2174. (*Mr. Mather.*) I should like to have some reason for the statement of Mr. Wheler. Is it because you think it impairs the map for the surveyor's use when this minute detail is shown surrounding houses and dwellings?—My chief reason is that by showing so much minutiae the map sooner becomes obsolete. Small changes are made, and the map then becomes incorrect.

2175. So you would rather keep to the boundaries?—I would rather not go into so much detail.

2176. And not so much filling in?—That is so.

2177. (*Chairman.*) Have you any more remarks on the 25-inch map?—No.

2178. (*Mr. Mather.*) Could you inform us, Mr. Wheler, whether the 25-inch map of Northumberland is used generally in the district, by gentlemen of your profession, for the purpose of purchasing and selling land?—Yes, I think I may say it is.

2179. Is it accepted as giving areas sufficiently near for the buying and selling of land?—Certainly; I think it is.

2180. You can buy and sell land from the details and particulars given upon the 25-inch survey?—In my own experience I should say certainly.

2181. (*Mr. Roby.*) You are taking and using these Government 25-inch maps, and are in the habit of taking them without thinking it necessary to have independent surveys?—I am.

2182. (*Lieut.-Gen. Cooke.*) I think you have already said you find the 25-inch maps to be absolutely accurate except where they are obsolete?—They are wonderfully accurate.

2183. (*Chairman.*) Do you make any use of the 6-inch map?—Yes, I do.

2184. As a pocket estate map?—Yes.

2185. Do you number that?—In some cases.

2186. For your own use?—Yes. It would be very useful if it could be numbered.

2187. Would you recommend that it should be sold numbered?—I should if it could be done without confusing the map itself.

2188. Do you not think it is too small for that?—That is the difficulty. It would depend on the workmanship.

2189. For the general public it would be in the way?—I could not express an opinion on that without seeing what could be produced by the process used at the Ordnance Department.

2190. (*Lieut.-Gen. Cooke.*) You do not think that a matter of great importance?—I think it would be a great convenience.

2191. (*Chairman.*) The 6-inch map is contoured?—Yes.

2192. Do you think the contour lines should be increased in number?—Speaking as an estate agent I think they are sufficient.

2193. This map of Northumberland is an earlier map. The more recent maps are contoured, the first 50 feet above the sea, then 100 feet?—Yes.

2194. And hundreds after that up to 1,000?—Yes.

2195. Do the contours run thus on your Northumberland map or are they closer?—I think they run as stated.

2196. And they are sufficient?—I have found them sufficient.

2197. Do you think they confuse the map?—No.

2198. Would it be any advantage if they were printed in colour?—No, I think not.

2199. You do not take a contour line for a footpath?—No, I have never done so.

2200. (*Mr. Roby.*) Then perhaps you are pretty well acquainted with the parts of the country where you have used these maps, where the footpaths are?—Well, that may be so.

2201. (*Mr. Mather.*) Have you tried your own power of interpretation of these maps, by going into a district unknown to you, and then taking a 6-inch map contoured and finding your way?—Oh, yes.

2202. And did you read the map easily?—Very easily.

2203. Even in a country strange to you?—Oh, yes.

2204. (*Mr. Roby.*) But the differences of level I take it are not so important to an estate agent as they would be to a person laying out a railway?—The contour lines and the bench-marks are very valuable.

2205. (*Lieut.-Gen. Cooke.*) To you as an agent?—Yes.

2206-7. Which are of the most value, the bench-marks or the contours?—They are both very valuable. Perhaps it would be a good opportunity of saying that in the reference in the area book, which I think you

have there, sir, the bench-marks and some other marks, I believe, are not given in the reference.

2208. (*Chairman.*) You think the description of distinctive signs in the area books is not full enough?—It is not.

2209. Bench-marks are not included?—No.

2210. (*Mr. Mather.*) Would it be a convenience to have more of these signs defined on the margin of the map itself?—It is important if the area books are discontinued.

2211. Yes, but even continuing the area books. Would you still like to have a larger reference to signs on the margin of the maps?—I think the map should be as complete as possible in itself.

2212. (*Chairman.*) It has been suggested to us that all these indications that are printed in the area book should be printed on the margin of the map. It has been suggested that it would be desirable?—Yes, I quite agree.

2213. How long have you had your 1-inch map?—It is an old map.

2214. (*Mr. Mather.*) You do not use it?—Not for matters of detail.

2215. Is the map you have a hill-shaded map?—We have both the hill-shaded and the other.

2216. Which is the more modern?—I cannot tell you.

2217. (*Chairman.*) Your 1-inch map you find is out of date?—It needs correction.

2218. It needs correction. You say something in these notes about publication. When you want a map, any particular map, do the indices published enable you to say what map you want?—Yes, they do, but the indices are not generally known to the public.

2219. Are they clear in themselves?—I think they are as far as my experience goes.

2220. The same index is used for the 25-inch map as for the 6-inch map?—Yes, I believe it is.

2221. And notwithstanding that you can pick out the sheets you want, either of the one series or the other?—We have had no difficulty, but we are somewhat acquainted with the maps perhaps.

2222. More than the general public?—Perhaps more than an ordinary purchaser.

2223. Do you think it would be desirable that the index to the 25-inch should be separated from the index to the 6-inch and the index to the 1-inch separate from the index to the others?—I should think they should be.

2224. And that they should be put in public places as a sort of advertisement of the maps that the public might be able to get?—Yes.

2225. (*Lieut.-Gen. Cooke.*) You live near Alnwick, do you not?—Yes.

2226. Well, have you any means in Alnwick to know anything about the Ordnance maps, supposing you were ignorant of them?—No.

2227. None whatever?—I believe none whatever.

2228. I suppose there would be in Newcastle?—I believe there is an agent in Newcastle.

2229. (*Chairman.*) Did you ever buy an Ordnance map in Newcastle?—No; I generally order the Ordnance map at a stationer in Alnwick, who sends for them.

2230. To London?—To London, I presume, and we have not always got exactly what we wanted.

2231. Has he got an index in his shop?—I am not sure; I have the index at the office.

2232. (*Mr. Mather.*) How long does it take you to obtain a map through that source?—Some days; and when obtained we are not able to return it if it is not what we want.

2233. Even though the mistake is not yours?—Even though the mistake is not ours, I believe.

2234. (*Chairman.*) I see in your notes you draw attention to the difficulty which arises to the public in the absence of the table for converting decimals into rods and perches. The general public would have no notion how to make the calculation, and areas of farms, parishes, &c. could only be gathered from many sheets of the map, at much labour. The public do not know how to convert the decimals into rods and perches,

Mr. E. G. Wheler.

26 May 1892

Mr. E. G.
Wheler.

26 May 1892.

the means for doing which is supplied in the area book?—Yes.

2235. That is a great inconvenience?—I think it would be to the general public. It does not arise to us.

2236. (Mr. Mather.) From a public point of view you think the areas ought to be marked in acres, roods, and perches, rather than in decimals?—No; I think the public are beginning to learn what the decimals mean.

2237. (Chairman.) On the 1-inch map are the different classes of roads sufficiently indicated?—I could not quite answer that question; I have not thought about it.

2238. You suggest that something might be done to show to what roads and footpaths the public are admitted?—From that point of view, if public ways could be shown, no doubt, it would be a public convenience, but I am afraid very great difficulties would arise.

2239. Can you suggest any way in which the Ordnance Department might take upon itself the responsibility of stating which path is a public one and which is not?—No, I do not.

2240. (Mr. Roby.) In the case of a good many rights of way claimed, no doubt there might be a dispute?—I have no doubt there would. That is the difficulty.

2241. It possibly might not be settled in any other way except by litigation?—Probably.

2242. (Mr. Mather.) Probably no other estate agent or commissioner like yourself on a large estate would be willing to admit that many roads or paths used by the public are rights of way, so that you would be no authority on the subject if you were asked?—I think it would be a purely legal subject.

2243. (Lieut.-Gen. Cooke.) You think the Ordnance Survey are wise in not trying to deal with the subject?—I do.

2244. (Chairman.) Do you make any objection on the ground that the true boundary of estates are not shown, because the Ordnance show the medial lines of the fences in the country?—No; I do not.

2245. Do you think that the Ordnance Survey have adopted the only practical mode?—I do; I think the same questions would arise as regards the right to public footpaths; there is often a disputed question as to the ownership of a fence, and if the Ordnance tried to lay it down it might lead to many matters of litigation.

2246. The names of places, do you think they are correct on the map?—In Cheshire they certainly were not.

2247. Do you know the method adopted of obtaining the names?—No, I do not.

2248. They probably had been obtained from local people?—They appeared to have been.

2249. Too local?—Yes.

2250. (Mr. Mather.) Do we understand Mr. Wheler complains of the names of Northumberland being incorrect?—No, I do not; I have not noticed any cases in Northumberland.

2251. Do you know "Mow-pen-brow" is called "Moppingbrow"?—I do.

2252. And that "The Alders" is called "The Howlers"?—I do.

2253. You mean when printed on the map?—Yes, I knew of many such, but they are the only two cases I remember.

2254. (Sir A. Geikie.) Is that the local pronunciation?—Yes.

2255. (Mr. Mather.) Would you go back to the original or take the conventional pronunciation?—This is a mere question of being spelt as it is pronounced in the vernacular. The proper name should be put on the map, the right name of the place.

2256. And the vernacular not recognised?—Certainly not.

2257. (Sir A. Geikie.) Putting within brackets the proper pronunciation. If you asked a countryman to direct you to "The Alders" he would not know what you meant unless you called it "The Howlers"?—I do not think that difficulty would arise; the local man would read the name on the map correctly, but would

pronounce it in his own way, like a man dropping the aspirate.

2258. (Mr. Mather.) Are you not in favour of keeping up the dialects?—Yes, but I am not in favour of the national map being used to keep up dialects of each county.

2259. (Sir A. Geikie.) Do you think that you might put the local pronunciation in brackets; I think the local pronunciation differs so widely from the spelling that it would be an advantage to have the two names; however, that is a very minor point?—It is.

2260. You think that the maps are too large, and should be able to be bought in small sheets, so as to suit the conveniences of smaller people?—I do, on account of price mainly.

2261. On which scale?—The 25-inch maps chiefly. My argument was that a small owner having his property, we will say, at the corner of a map, has to purchase four large sheets for the sake of that one small property on the corner. The lowest price at which the Ordnance maps are published, I believe, is 2s. 6d.; he has to pay 10s. to show that one piece of property upon the corner of the map.

2262. Would you suggest that the Ordnance Survey Department, on his application, should print him a special sheet?—If it were possible for sheets to be alternatively printed, showing that as a centre of a map, no doubt it would meet the case, but I presume that it is impossible, but if he could get four quarter sheets at a less price it would of course meet the case also.

2263. (Lieut.-Gen. Cooke.) Then would you publish the 25-inch in quarter sheets do you mean?—It would be a convenience for the public.

2264. (Chairman.) No attempt has been made to revise any of your 25-inch sheets?—No.

2265. And they are very much out of date in the neighbourhood of your town?—This map produced is an instance, it does not show the buildings on the property; it is a sheet near Percy Main in Northumberland. These railways coloured yellow are new; this road running through the whole of the map is new.

2266. And is this much covered with houses?—There is a good deal of building land in portions of the map.

2267. Is this an urban district—I mean from a local point of view?—Yes.

2268. Or rural district?—It is within the Urban Sanitary Authority of Tynemouth.

2269. (Chairman.) Do you think it would be practicable for the Ordnance Survey Department to be informed by local surveyors, the surveyor of the local board, or the surveyor of a municipality, of changes as they occur?—I do.

2270. And furnished with the plans which in accordance with their byelaws have been deposited with them?—I do.

2271. And that the Ordnance Survey Department should put them on their map?—Yes, the only difficulty that could possibly arise would be on the score of accuracy.

2272. Upon that point do you think it probable that absolute accuracy would be secured, or would it be very imperfect?—I think it would vary, but I do not think it would be very imperfect, and if a periodical revision were taken by the Ordnance Department, it would correct these errors.

2273. Supposing in fact they were to put on their map the additions which were sent to them from year to year and print upon that map "This is an interim map from local information, not guaranteed," and then once in 15 years they were to revise, the needs of the public would be better satisfied than they are at present?—Very much.

2274. And probably at much less cost?—I think so.

2275. (Mr. Mather.) But why should not the information supplied by the local authority from the local survey be accurate—I mean provided proper arrangements are made by the local authority to get accurate information?—I know that no two surveys absolutely agree, and I believe the Ordnance survey has been most carefully checked by two or three revisions which have been made, but local surveyors will not go to that trouble.

2276. Excuse me I am now speaking of a possible arrangement between the Ordnance Survey Department and the local authority that local surveyors should be charged with the duty of keeping up most accurately and carefully the changes which are made from time to time?—Yes.

2277. So that no periodical survey of 15 years apart shall be necessary by the Department?—I do not think that will be sufficiently accurate.

2278. Do you mean that local surveyors cannot survey accurately enough?—I judge from the inaccuracy of the old tithe survey throughout the country.

2279. I am not speaking of anything old, but of the new?—That was the work of local surveyors.

2280. Yes, but not under the new regime. This is rather an important point we have had suggested to us by very competent witnesses in these matters, gentlemen in your own profession, who seem to think that it is absolutely necessary to have some local aid in order to get the requisite information to keep the Ordnance maps right year after year?—That I quite agree with, but I think it is very important that these local surveyors should be periodically checked from the Ordnance Survey Department if possible.

2281. (*Sir A. Geikie.*) From your experience of the capacities of local surveyors would you be disposed to trust to the accuracy of a map that was made in this way, corrected from time to time merely from the surveys of local surveyors?—No, I do not think I should.

2282. Do you think from your experience of surveyors that there would be a general feeling of confidence in such a map?—Not to the extent there is in the present Ordnance map.

2283. (*Mr. Mather.*) I do not quite see how you could possibly make many blunders if the local surveyor was competent to do his work, and charged with doing it with such a sense of responsibility as the Ordnance surveyors now have, or why you should not get this done continuously and accurately?—No doubt a great many men would, but where you have a large number of men whose work is not checked can you quite depend upon it?

2284. I mean working in connexion with the Department, so that before the information gets old, before it is recorded, there would be a check instituted by the Department, in connexion with the local authority, to ensure that what is recorded is for the time being absolutely correct?—That quite alters the point; I think by that means it might be done.

2285. (*Mr. Roby.*) What I understood you to say is that the general opinion is that the local surveyors could give provisional indications of changes, but that that would not be accepted or be regarded by you as absolutely satisfactory until they had been checked by the Ordnance survey?—Yes.

2286. (*Mr. Mather.*) By arrangement with the Department, not checked haphazard?—I thought you meant that local surveyors' survey was to be taken without checking. That would not be satisfactory; some would be good and some not good.

2287. You do not think this revision could be made from year to year, and at the same time be accurate?—As far as I see it would be most valuable, but arrangements should also be made for obtaining information of private alterations that do not come within the cognizance of the local authority.

2288. (*Chairman.*) In fact you say in your notes that the very accuracy of minutiae of the 25-inch maps is a source of their rapidly becoming antiquated if not revised?—Yes.

2289. And it is sincerely to be hoped that the great initial cost of this most excellent and valuable work may not be allowed to become useless by the false economy of refusing a sufficient grant for its necessary maintenance and periodical revision. That sums up your opinion on the matter?—Yes, it does.

2290. And a method has now been suggested by which it could be kept very closely up to date?—It appears to be a practicable one.

2291. At all events in a provisional manner?—Yes.

2292. (*Lieut.-Gen. Cooke.*) You would have nothing put on the maps which was got from civil surveyors until its authenticity had been guaranteed by examiners from the Ordnance Survey?—No, unless it is

done in such a manner that it would be marked as imperfect and not reliable.

2293. (*Chairman.*) If a sheet is published with this note to it: "Surveyed 1880, provisionally altered from local surveys or by local surveyors, but not guaranteed by the Ordnance Survey Department"?—Yes, with the date of the alterations also given.

2294. And that sheet would be more useful than the existing obsolete sheets that are published?—Certainly.

2295. And that sheet so provisionally issued you would occasionally go over and certify as properly surveyed?—Yes.

2296. By the Ordnance Survey Department?—Yes.

2297. And then it should be perfectly satisfactory?—Quite so.

2298. (*Lieut.-Gen. Cooke.*) But would it not be better as soon as the information comes in from the local surveyor to have it at once examined by the Ordnance Survey and corrected if necessary?—The sooner the better if possible.

2299. (*Mr. Mather.*) Would not a provisional arrangement be most misleading, because if any person purchasing the map were to find on this map, "revised such a day from local information but not guaranteed by the Department," he would be at sea, not knowing whether he is to rely on provisional information or not. Do you not, from your own experience, say that it would be better to have an accurate revision?—Certainly.

2300. And take any trouble to arrive at that?—If it would be possible, otherwise I was thinking of suggesting that, if it is impossible to keep it up to date in the way you propose, that this provisional arrangement might be printed in a different coloured ink.

2301. But you would prefer to have it permanent?—Yes, certainly.

2302. If it could be done it would be far better?—I fully agree with that.

2303. (*Chairman.*) Have you found any errors in the parish boundaries as shown?—I have, one important error and some smaller ones.

2304. (*Lieut.-Gen. Cooke.*) Is that in dealing with a large number?—Yes.

2305. (*Mr. Roby.*) On which map?—On the 25-inch map. The parish boundary between the townships of Rennington and Little Houghton in Northumberland, in which there seems to be some 70 acres put to the wrong parish.

2306. (*Chairman.*) Do you know at all how that arose—because meresmen were sent?—I had some communication with Sir Charles Wilson on the subject.

2307. It was not the fault of the Ordnance Survey?—They had taken certain steps, but probably not quite sufficient, or the local people had not taken sufficient interest in the question.

2308. (*Mr. Roby.*) I suppose the map had been shown in the neighbourhood, and the people had been called upon to say whether it was correct or not—the parish boundaries?—I presume so; that was before my time.

2309. From an estate agent's point of view, do you find the hill-shading useful, or the reverse?—The reverse, it confuses the map.

2310. (*Mr. Mather.*) Which map?

2311. (*Chairman.*) The 1-inch map?—The old 1-inch map.

2312. You prefer a plain map?—Yes, with the contour lines.

2313. Have you seen the lithographed 1-inch map that has been published lately?—No, I have not.

2314. (*Mr. Mather.*) Do you use the 1-inch map much, Mr. Wheler, for estate purposes?—Only to find one's way about the country.

2315. Is not the hill-shading very useful for that purpose?—No. I would sooner have the roads clearly shown.

2316-7. The roads clearly shown—the hills?—It does not want the hills shown to go about the country; I do not think they assist you at all, and to me they are rather deceiving; I do not understand and appreciate the difference in shading.

2318. (*Chairman.*) Do you mind looking at that, Mr. Wheler, the last publication of the Department showing the hill-shading. Do you approve of the form of

Mr. E. G. Wheler.

26 May 1892.

Mr. E. G.
Wheler.
—
25 May 1892.

this cheap photo-zincograph map which they are publishing now?—It is a very useful form, no doubt, for some purposes.

2319. With the parishes shown in different colour?—Yes.

2320. But you would publish the engraved map in two forms, plain and with hill-shading?—Yes.

2321. (*Mr. Roby.*) Does not colour on the maps interfere with your subsequent use of them, where you wish to use colour of your own?—It is very important to be able to buy maps uncoloured.

2322-3. (*Mr. Mather.*) We have another example of hat uncoloured; would you just look at that, Mr. Wheler?—It is an uncoloured map of the same type as that which I have seen coloured on thin paper. I would suggest that these maps should be published, all the maps in fact should be published, printed on tracing cloth.

2324. (*Chairman.*) Tracing cloth?—Tracing cloth or good tracing paper, perhaps both; they would often be very useful.

2325. (*Mr. Mather.*) You could scarcely get an impression on tracing cloth, could you?—Then perhaps on good tracing paper; but I think they might be printed on the rough side of tracing cloth.

2326. But the tracing paper is very objectionable when you crease it in your pocket owing to the finish of the paper?—I know it is; tracing cloth would be much the best. These maps are too clumsy for carrying about.

2327. (*Mr. Roby.*) In short, you would desire the maps to be published on thin paper, as strong and white as you could get it?—Yes.

2328. (*Chairman.*) You do not want thin paper for the 25-inch?—I do not want what I call the standard map to be on thin paper, but if copies of it could be purchased in some form that would be more portable—either cloth or thin paper—and which could be folded up, it would be very useful.

2329. I think that might be practicable for the 6-inch and for the 1-inch, but not for the 25-inch?—I see no reason why the 25-inch might not be so published.

2330. (*Mr. Mather.*) The sheets are the same though different in size.

2331. (*Chairman.*) Would you make a special payment for special sheets?—Could not they be published at the same cost?

2332. (*Mr. Mather.*) You would like to have a certain proportion of the impressions taken from the zinc-plate before it is destroyed on this fine thin strong paper?—My impression is that it would tend also to increase the sale of the maps for general purposes; people coming up to London on legal and other questions of that sort have to carry these large maps; they are not easily carried about, but if they could be published in a more portable form, I think it would constantly save their having to be traced by local surveyors, and instead of the local surveyor having the work to do it would be done by the Ordnance Department and more copies would be sold. They would be more convenient for transmission by post.

2333. (*Chairman.*) You suggest then that all the maps should be published both on the present paper and upon thin paper?—A thin paper or cloth if asked for.

2334. (*Lieut.-Gen. Cooke.*) They could not be got specially, they must be published at the same time?—Well, they might be obtained if asked for, that is what I meant to say.

2335. (*Chairman.*) And you think there would be a sale for them, especially in populous places and towns?—Yes.

2336. One other question about the sale of—the 25-inch maps—which are published coloured and uncoloured?—Yes.

2337. Uncoloured they are only skeletons, and you cannot distinguish houses from anything else—from enclosures?—That is so.

2338. The object of the colouring is to block them out in fact?—Yes.

2339. But that makes sheets very expensive in some cases?—Yes.

2340. You like instead of the skeleton form to have all the maps hatched?—Yes, I should.

2341. Diagonal lines?—I understand two editions, a skeleton edition and hatched edition of the maps?—Yes, I think so.

2342. You see no objection to having them all hatched?—I see none.

2343. (*Lieut.-Gen. Cooke.*) Your answer applies to the 25-inch and not to towns; have you never practised with town maps to give an opinion?—I take for comparison that town map of Alnwick, it is on a 10-foot scale and unhatched, and here is the 25-inch map with the buildings coloured; I think if this were hatched it would be far clearer to show buildings and what not.

2344. The objection that is made to hatching as against colouring is, that if the map is hatched you get it in that form only and the hatching interferes with the alterations you want to make; do you think that is an objection?—My experience is that where there are large buildings in a town or village, it is almost always necessary where alterations are required to make a tracing from the map.

2345. (*Mr. Mather.*) But you do not care to have the blocks coloured?—No, I would just as soon have them hatched.

2346. (*Mr. Roby.*) You do not like it quite plain, without any hatching?—Then one does not know which is a house and which is a courtyard.

2347. (*Mr. Mather.*) You would prefer the hatching should be very faint?—It cannot be too light.

2348. (*Mr. Brickdale.*) With respect to the uses of the Ordnance map for the definition of property in deeds, I see you have inserted some new railways on your map?—Yes.

2349. Do you insert these from your own survey or from the company's plan?—From the company's plan.

2350. And do you find them sufficiently accurate for all property purposes?—Yes, as far as my experience goes.

2351. So that if you were making a map for a department of a part adjoining that railway you would probably use that map?—I should; but in that case I should have the measurements checked to be quite sure.

2352. On the ground?—Yes.

2353. By your own men?—Yes.

2354. You would not recommend the use of the company's plans for property purposes without having them checked upon the ground by the owners or their agents?—It is safer to do so.

2355. Then as to the local surveyors, there was a proposition that the local surveyors should send details of roads and alterations of the neighbourhood to the Ordnance Survey?—Yes.

2356. And you thought that might do for many purposes, but would not quite do for their final publications?—Without correction.

2357. Do you think it would do for property purposes without correction?—Would you explain what you mean.

2358. Do you consider it would ever do for sales and purchases?—I think it is a most important thing that you should have the exact definitions of areas for sale and purchase, as these must be most accurate or it will lead to legal difficulties.

2359. Even where the land is fenced and fences are shown on the map?—Yes; even in this case if a man buys a certain number of yards in cases of buildings, and he finds he has not got that number of yards, he is very apt to raise the question.

2360. That would be the case whether the land were fenced or unfenced?—It would not be so important if it were fenced, certainly.

2361. And do you find a difficulty in laying down alterations on the Ordnance map owing to the slope of the ground?—The slope of the ground is not taken into consideration in the Ordnance map, and we should not do so in our survey.

2362. That is what I wanted to come to; and generally do you think surveyors laying down plotting on the Ordnance map adhere to the Ordnance system on

the horizontal survey?—Certainly, they ought to do it if they know their business.

2363. Practically, do you think they do as a rule?—As far as my experience goes they do, certainly.

2364. They do?—Yes; but of course there is a great difference in surveyors; some men make very accurate surveys and some men do not.

2365. (*Mr. Roby.*) Yes; but an acre means a horizontal acre, not an acre of slope ground?—Certainly.

2366. (*Mr. Brickdale.*) Do you ever find a difficulty in laying down boundaries properly on the Ordnance map owing to the vagueness or inaccuracy found in old deeds?—Yes; there is a difficulty very often. I can instance a particular case in which some land has been sold or let on a long lease to the Newcastle and Gateshead Water Company, of which the Duke owned about one-half, bounded by the township boundary. That

land is now a large reservoir for Newcastle, but the boundary in the old deeds does not by any means coincide with the present township boundary, as laid down by the Ordnance maps. We have accepted the Ordnance as being most probably the more correct of the two. But it is a question I think of some acres between the two maps, some 3 or 4 acres.

2367. I suppose in laying down the boundaries for the conveyance of any portion of the Duke's land, if the maps or descriptions in the old deeds were vague you would take the Ordnance map and make a fresh survey?—Yes; in all cases the old maps were never so accurate by any means as the Ordnance, and for this reason I am of opinion that any scheme of compulsory land registration such as has often been discussed, must necessarily depend upon a proper and regular revision of the Ordnance Survey, without which, independently of legal and other difficulties, it will be an impossibility.

The witness withdrew.

Mr. EDWARD STANFORD, junior, 26 and 27, Cockspur Street, sole agent for England and Wales for the sale of Ordnance maps, called in and examined.

(The witness produced a number of maps as specimens.)

2368. (*Chairman.*) Will you, first of all, discuss the maps in series, first the town maps, then the 25-inch maps, and then the 6-inch. We will begin with the town maps. Would you make any statement in regard to your experience as to whether the town maps are satisfactory?—I think, sir, as far as the work goes, they are satisfactory as far as I can judge it, but they are not satisfactory as regards variety. They are issued in a large number of ways which I think is undesirable, and they are not all to be had in one way; that is, you can have some of them uncoloured, others can be had only coloured, and you are not always able to get them alike.

2369. Alike in what?—You are not always able to get them alike, even of the same towns.

2370. They are sold coloured and uncoloured, and you cannot get them all of one sort?—You cannot get them all of one sort.

2371. Not from Southampton?—Not always.

2372. If you applied for an uncoloured map from Southampton, they do not supply it, or cannot supply it?—They are not always able to do so. Would you allow me to show you an instance?

2373. (*Mr. Mather.*) Is it the 10-foot map you are speaking of, Mr. Stanford?—I believe it is, sir; yes, it is the 10-foot map. Here is a case of Cambridge, you cannot get that sheet ruled.

2374. By ruling you mean hatched?—Yes; and you cannot get that sheet coloured, and they are of the same town.

2375. (*Mr. Roby.*) They are adjoining parts?—They are adjoining parts.

2376. (*Chairman.*) Is there any date on those two sheets?—The hatched is 1886, and the coloured is 1888; they are not joining sheets. I may mention these are selected at random from my stock by my assistants.

2377. (*Mr. Mather.*) This ruled sheet is attainable in no other form?—It is not able to be got in any other form but this.

2378. (*Chairman.*) That coloured sheet is the latest sheet, is it?—That is the later.

2379. (*Mr. Primrose.*) Could you get this ruled sheet in outline without hatching?—You are not able to get that in any other shape except this, I understand.

2380. (*Mr. Brickdale.*) Is not this coloured sheet to be got plain, uncoloured?—It is able to be got uncoloured, but it is not able to be got what we call ruled like that.

2381. (*Chairman.*) We have this in evidence, Mr. Stanford, that if you have a hatched sheet you could only have it in that form, and you could have the other kind either as a skeleton or coloured, whichever you pleased?—But what we say is a weakness, and a good many customers do not like it, is that they are not able to get it in any one form complete.

2382. One is bound to agree with you there certainly; is that hatched form an objectionable form?—It is the most desirable form, in my opinion.

2383. Do you know whether it has been objected to by the public?—I did not know it had.

2384. You have had no complaints?—I have had no complaints as far as I know.

2385. (*Mr. Mather.*) And you have made none to the Department?—I have made none to the Department that I know of. I say they all ought to be produced in that way, and not coloured; this is only one case, I do not say it often happens.

2386. (*Chairman.*) Do you sell many town plans?—A good many.

2387. A great many?—A great many.

2388. Of every town?—Well, they vary a good deal, but of all the larger ones we sell a great many.

2389. A constant sale going on?—A constant sale going on.

2390. Not only to public authorities but to private persons, and property owners in the place?—Yes, a good many, but there is not that demand which I think there ought to be, but still there is a demand.

2391. Are the town plans sold in the towns; is there any stock kept in towns; all stock comes from you, does it not?—It all comes from me except at Southampton; I mean there is an agency in Southampton which has a stock direct from the depot.

2392. (*Mr. Roby.*) You are speaking of England only?—England and Wales.

2393. (*Chairman.*) All other traders come to you for any maps they wanted?—Yes, sir.

2394. Is there no stock of any maps kept in any of the towns?—Oh, yes, sir, in all the big towns.

2395. All the big towns?—All the big towns; all the leading men keep them.

2396. Keep the town plans?—Keep a limited stock.

2397. And a stock of their own neighbourhood?—A stock of their own neighbourhood; if we consider they are good booksellers, they do that.

2398. (*Lieut.-Gen. Cooke.*) Is it sale or return?—It is not sale or return.

2399. (*Mr. Mather.*) On their own selection they order from you?—On their own selection.

2400. Perhaps I may ask Mr. Stanford what he means by saying they ought to sell more of these town maps; what is the hindrance, in your opinion, to more being sold?—It is rather difficult to say, but I think the hindrance is that the indexes are not quite what we want, there is no other difficulty, as far as I know.

2401. Is the difficulty with the Department, or with your sub-agents, or the indifference of the public?—I think, if anything, it is that the agents cannot afford to keep stock to a great extent, but there is no difficulty in getting maps, so far as I know.

2402. (*Chairman.*) But the delay of applying to you rather checks sale?—I do not think so, sir. I mean, if they have not got them in stock, they must get them either from me or from some other depot; they do not keep sufficient stock.

Mr. E. G. Wheeler.

26 May 1892.

Mr. E. Stanford.

Wilson,

Wilson,

See Wilson, p. 221.

See Wilson, p. 221.

Mr. E.
Stanford.

26 May 1892.

2403. You say the difficulty is there not being sufficient stock?—The local agent does not as a rule keep sufficient, he does not find it worth his while to keep a good enough stock.

2404. The consequence is that when a man comes to him and says I want to buy sheet No. L, and he has not got sheet No. L, he has to apply to you?—Yes.

2405. That delay affects the sales?—It does to that extent, of course.

2406. (Mr. Mather.) Do you purchase your stock from the Department, or is a certain quantity consigned to you by the Department?—It is all consigned to me on sale, sir.

2407. (Lieut.-Gen. Cooke.) Is it sale or return?—It is really, sir, because I do not buy it outright, but I am not allowed to send back to Southampton anything that I like, so that it is not really sale or return, I have to ask permission to send back anything I wish.

2408. But it is not paid for?—It is not paid for; not until I have sold it it is not.

2409. (Mr. Mather.) But when agents order from you you require them to pay cash I presume for their order?—Oh, no, sir; all the big agents have monthly accounts exactly as I have; they pay on the same day as I do.

2410. But there is no consignment as between you and them?—There is no consignment.

2411. (Mr. Roby.) Do you think the stocks in the country would be considerably increased if they could get them as they get books on sale or return?—Oh, undoubtedly so.

2412. (Chairman.) Now we will go to the 25-inch map; are you satisfied with that map as a whole?—That is a large question.

2413. Yes, it is the whole question; do your customers find fault with the 25-inch maps?—They only find fault when a map is very old.

2414. Objection is taken to the 25-inch map in a good many cases when it is obsolete?—When it is, obsolete and wants revision.

2415. (Lieut.-Gen. Cooke.) You have no complaint of inaccuracy in the original survey?—As a rule, none; if there are any it is from alterations in the interval.

2416. Obsolescence, in fact?—Obsolescence. There are some owners who write to me occasionally that the Ordnance Survey have not got the names of their places correctly put in the maps and that sort of thing.

2417. (Chairman.) There are errors in spelling?—Yes, but beyond that and the obsolescence of the map, I should not say the map is in any way objectionable.

2418. Do you keep both the uncoloured and the coloured impressions?—We do not keep the uncoloured.

2419. You obtain them on demand?—We get those on demand.

2420. When required?—When required.

2421. Are they often asked for?—Oh, yes, frequently; now much more so, it is on the increase.

2422. The colouring makes some sheets most expensive?—It does.

2423. As uncoloured they are very cheap?—As uncoloured they are very cheap, but a lot of the maps I cannot sell at any price coloured; the very expensive sheets, the 15s. and 20s. sheets, I cannot sell at all.

2424. You think it desirable that all the sheets sold should be sold at the same price, and that could be done if they were hatched?—Yes.

2425. If colouring were abolished?—I think they ought to be averaged, sir, one way or the other.

2426. If the colouring were abolished and hatching done, every sheet should be sold at the same price?—Yes.

2427. That would be better?—Yes, much, I think.

2428. (Lieut.-Gen. Cooke.) Mr. Stanford has suggested another way, namely, to issue all the coloured sheets on an average?—That is also a suggestion.

2429. (Chairman.) Would you suggest that the coloured sheets should be sold at an average price so that those that are worth or have cost 20s. should be sold at 4s. 2s. 3s. 6d. Yes.

2430. And the sheets that are now sold at 3s. or 3s. 6d. the coloured sheet should be put up to 4s.?—Yes.

2431. What is the lowest price for a coloured sheet do you know?—I think about 3s.; I think they used to be 2s. 6d., some of them.

2432. 2s. 6d. is the price of the sheet uncoloured, is it not, in every case?—Yes; but I think you used to be able to get them in a good many cases coloured at that price too.

2433. (Mr. Mather.) Is there any object at all in having a coloured sheet, in your experience; supposing you could not get them, would you find the public complaining to you if they got these hatched sheets supplied for all purposes, would they request you to give them coloured sheets instead?—I dare say they would, sir.

2434. In many cases, or is it a mere matter of accident?—I do not think, as a rule, they would object; a large landowner is not particular as to what he gives for a sheet, but it is only the ordinary individual that looks at the extra money.

2435. So that the special purchaser might have it coloured if he wanted it?—He might have it if he wanted it.

2436. Though if they are all hatched it is not much use coloured after the hatching?—It is not much use.

2437. (Mr. Roby.) As things stand at present would it meet the public convenience if you get your stock of uncoloured maps rather than the coloured?—I do not know, sir; I cannot say, because we have never tried it.

2438. (Chairman.) Where there is a considerable number of houses the uncoloured sheets are unsatisfactory because you do not know what is a house and what is an enclosure?—Yes, they would be unsatisfactory in that respect, sir.

2439. And that is the object of colouring the sheets?—That is the object of it.

2440. (Mr. Mather.) Or hatching?—Or hatching.

2441. (Mr. Roby.) That would be the object of colouring, but the better system would be hatching, which would not interfere with the map itself.

2442. (Chairman.) Supposing the colour, which generally means that red colour, were abolished, would you continue to colour the water?—I do not think so.

2443. You would leave that unindicated in that way?—I think so.

2444. Ruling would be inapplicable to that?—Oh, yes, quite. I take it you would only use ruling where the red colour is given.

2445. I suppose at 2s. 6d. a sheet you would think that a cheap map?—Quite.

2446. Is the paper found fault with by your customers?—Which map, sir?

2447. The 25-inch?—On the whole, sir, no; that is satisfactory I should say.

2448. Would an edition on thin paper be any advantage to the public?—I do not think so at all.

2449. You have not heard of any demand for it?—No.

2450. The area books have been discontinued?—Yes, sir.

2451. Have you had complaints about that?—They have not absolutely been discontinued, sir, I have a great many in stock still.

2452. But all the area books that you have belong to the old impressions?—Yes, I think area books belong to impressions I have there, sir.

2453. (Lieut.-Gen. Cooke.) The impressions published before the change was made of putting in the acreage on the plates?—But I do not think areas are on the sheets.

2454. (Chairman.) Take Gloucestershire for instance; the sheets in my districts in Gloucestershire have not got the areas published on them, and area books are published?—Yes.

2455. But in some counties, Somersetshire for instance, I should find the areas on the sheets?—You would find the areas on the sheets.

2456. Then in fact you have not area books for all sheets?—We have not area books for all sheets.

2457. Which is preferred the printing on the sheet or the purchase of the area book?—I think the printing on the sheet, sir.

2458. The area book is always an extra expense; it is a separate purchase?—It is, but I do not think it is an extra expense; on account of the areas being put on the sheets they have raised the price 6d. a copy; if you get eight sheets it is not a saving.

2459. The sheets are 6d. each dearer in consequence of the abolition of the area book?—I believe that is so.

2460. (*Mr. Mather.*) What did the area books cost you?—The area books were 1s. 6d. or from 1s. 6d. to 4s.

2461. Was it cheaper to have the area books then for all series of maps and not to have the areas marked on maps than to purchase the maps with areas without the area book?—I should say under the existing system for a number of sheets, say, six or eight sheets, that you would lose money by the new system.

2462. (*Chairman.*) It is more expensive for the public?—I think it is a little.

2463. To have the area marked on the map than to purchase the area books?—I think it is a little, but I think it is much more desirable to have them on the maps.

2464. (*Lieut.-Gen. Cooke.*) Notwithstanding that you think it is a very great gain?—It is a very great gain.

2465. (*Mr. Roby.*) Where the area is on the map, has anybody ever applied to you for an area book?—Not so far as I know; I am not quite certain, I do not think so.

2466. (*Chairman.*) No complaint ever reached you as to the abolition of the area books?—Oh, no; when I say no complaints, I mean I have not any recollection of any at this minute.

2467. (*Lieut.-Gen. Cooke.*) I suppose you mount a good number of plans for your customers?—We do some.

2468. Have you had any difficulty in joining the Ordnance Survey plans together, owing to the difference in the contraction and expansion of the paper, or to a difference in the texture of the paper?—We have had that, sir, very largely, but we have not had it so much in that scale, the 25-inch scale. We have had it more on the 6-inch scale.

2469. (*Chairman.*) Is that owing to the 25-inch scale paper being of a very uniform quality?—I take it that it is owing to the paper being of a very uniform quality.

2470. The quality of the paper of the 6-inch scale has varied a good deal?—The 6-inch scale has varied a good deal.

2471. You have had great practical difficulty?—I have had great practical difficulty, on many occasions, particularly on the 6-inch.

2472. (*Mr. Mather.*) The smaller the scale the less would be the shrinkage; the larger the scale the less it would be observed?—Oh, of course.

2473. (*Mr. Roby.*) For mounting, do you like the thick drawing-paper that the maps are on usually, or very thin paper?—You do not want very thick or very thin paper; those 25-inch maps mount very well as a rule.

2474. (*Chairman.*) Is that thinner or thicker than the 6-inch paper?—I should say it is a trifle thicker.

2475. (*Lieut.-Gen. Cooke.*) When you referred to the 6-inch not mounting well, did you refer to the old engraved 6-inch, or to the new photographic 6-inch, or to both?—To all the 6-inch.

2476. Both engraved and photo-zincographed?—The great difficulty in the 6-inch is the old and the new survey coming together—the old engraved survey and the new photo-zincographic—and also the white paper and the cream-coloured paper coming together, which has been a great trouble.

2477. (*Chairman.*) Have you any large stock now of that yellow paper?—I mean of impressions printed on that yellow paper?—Well, sir, I was asked that question by the Stationery Office, and I have not answered it yet. I have not been able to look out how many copies we have, but I should think we have got a good many.

2478. Well, now, with regard to that 6-inch map generally, is that map approved of by your customers?—I should say, as regards the geography, it is, wherever it is new.

2479. Where it is new?—Where it is new; but on the whole I should say there is a good deal of discontent with the new 6-inch map.

2480. What are the faults?—Oh, to begin with, the people do not like photo-zincographing; they say it does not look so nice as the engraved plate, a thing I quite agree with. As I say, there has been a great deal of trouble about the joining of the sheets, like the white and the yellow sheets. I believe that the yellow are now exhausting themselves.

2481. They are nearly exhausted?—In fact, they are asking me to sell them off at a reduced rate now.

2482. The Ordnance Survey people?—Yes, 8d. a copy.

2483. (*Mr. Mather.*) Are they otherwise as good as white sheets excepting for colour?—They are quite as good, except they have not got the contours, I think, sir.

2484. Then they are much older?—They were the first editions.

2485. (*Chairman.*) Have you had many instances of a change of plan from black houses to ruled houses in towns?—I believe there have been some alterations, but they have not come under my personal notice very much.

2486. Have you had any notice of similar cases to the city of Gloucester; two sheets of the city of Gloucester are in black, and two sheets are ruled?—That is one that was discovered last week in my shop.

2487. I believe so?—When I was there.

2488. I did not know that you were there though?—I was there when the assistant brought it to me to ask me what he was to do about it.

2489. (*Mr. Roby.*) Have you seen instances of other towns in the same condition?—I did not know, sir; I should not like to say that I have; but I believe there are cases. These things are not all under my notice, and if you would like to have the manager of my stock keeping department he will be very glad to give you any information of that character; but I do not know them all myself.

2490. (*Mr. Mather.*) Referring to your stock, Mr. Stanford, would you advise the withdrawal altogether of those yellow sheets and uncoloured maps rather than their sale at 8d. instead of 1s. per copy?—I should, sir; I think it is beneath the dignity of any Government department to offer a job lot of maps at 8d. a copy.

2491. They are damaged goods, and ought to be withdrawn from the market?—That is what I consider, sir.

2492. (*Chairman.*) Have you found any difficulty in mounting the white papers together; of course one quite understands there would be serious difficulty with the yellow papers and the white papers; but as a mounting question, with the white paper lately used for the 6-inch map, have you found any difficulties to arise?—I believe not, sir.

2493. You think the white paper is good altogether?—In connexion with certain impressions, that is in connexion with the new photo-zincographic maps, I do not think there is any difficulty.

2494. All these go together?—I think those go together, sir, the ones on white paper.

2495. A case was discovered in your shop last week about the city of Gloucester being half black and half ruled; should you take it upon yourself to address a remonstrance to Southampton?—Should I, sir?

2496. Yes?—As a rule, no.

2497. You would say nothing?—No; I do not consider that is within my duty.

2498. (*Mr. Mather.*) Do you never complain?—Sometimes, sir.

2499. (*Chairman.*) Your business is simply to sell their productions?—I consider that is my business, sir, and to get rid of them within my means.

2500. You remonstrated with them about the yellow sheets?—I remonstrated with them this week.

2501. Do you not think you might address a remonstrance about that—about black and ruled Gloucester?—Well, sir, I did not think that was within my duty.

2502. (*Mr. Mather.*) That had more to do with the style of the map and the execution of the map; not so much that they were saleable or unsaleable?—I consider I have got to get rid of everything they give me, sir, as far as I can; that is my view of it.

Mr. E. Stanford.

26 May 1892.

See Wilson, p. 221.

Mr. E.
Stanford.

26 May 1892.

2503. (*Chairman.*) Do the public like the contoured or the uncountoured maps?—I do not think the majority of people care much about it.

2504. They do not know the difference?—They do not know the difference; but, of course, educated people like contours.

2505. Have any of them made observations to you or your people about the insufficiency of contouring?—They have made remarks on that, sir. I believe the contouring now only extends up to about 1,000 feet; I am not certain, but of course the argument that geographers and others use is, that if they are contoured up to 1,000 feet they ought to be contoured beyond.

2506. But the contouring up to 1,000 feet is sufficient in quantity?—I believe so, sir.

2507. It is contoured at intervals of 100 feet up to 1,000?—I believe so.

2508. No persons have said they ought to be contoured closer?—No, not within my knowledge; they do not come to me with these things, sir, they do not suggest these things to me, they only consult me as to the business aspect of the question, as to what they can get; they do not say what ought to be got.

2509. (*Mr. Roby.*) You mean the Department consults you?—The general public, sir. Of course they know I am merely the agent, and I cannot do anything as regards production.

2510. (*Chairman.*) Well, now, with regard to the 1-inch map; I suppose your largest sale is of the 1-inch map?—Oh, no, sir; do you mean in amount?

2511. In amount?—Oh, no.

2512. (*Mr. Mather.*) I think we might elicit a little more closely from Mr. Stanford why he regards himself only as an agent, to buy and sell what is committed to his care. Surely, in dealing with all the other goods that you sell you have some complaint to make against the manufacturers if they do not satisfy the public?—Oh, yes, sir; but as regards other manufacturers, I am not quite in the same position as I am as regards the Government.

2513. Why?—As regards other manufacturers, if I buy their goods I am their master, and I can say, "I will not have them"; but as regards the Ordnance Office, I cannot say I will not have their goods—I have to get rid of their goods.

2514. But if goods are consigned to you from any other source than a Government department you adopt the same terms of business?—If I did not like them I would not have them.

2515. Would it not be within your province to complain to that manufacturer that his goods were not sold, because they were not of the proper standard?—It would, sir.

2516. And have you not adopted the same line with the Government Department?—The only line I have taken with the Government Department is as regards indices, sir.

2517. (*Mr. Roby.*) With regard to Mr. Mather's question, may I ask are you agent for any other person or body than the Government; are you in a similar position as regards any other person that you are with regard to the Government?—Oh, yes, I have goods on sale and return.

2518. (*Chairman.*) Do you sell Mr. Bartholomew's maps?—Yes, I sell some of them now.

2519. Do you do that as agent for Mr. Bartholomew, or do you keep his things in stock?—I was recently an agent for him, sir; but I had to resign that position. He used the word "Ordnance" to which I objected.

2520. (*Mr. Mather.*) And you would have complained to him if his goods on sale or return were complained of by the public?—Oh, yes.

2521. But you have not done so with the Government Department?—I have not as regards the Government Department; because I consider myself a Government servant, sir, in this matter.

2522. (*Mr. Roby.*) You are appointed for a certain number of years as their agent for the disposal of maps?—Yes.

2523. And in regard to other people you are not in that position; you simply happen to buy a particular lot consigned to you and sell it?—I am not in the position, in this case, to send them back.

2524. (*Chairman.*) Your sales of the 1-inch map are tolerably regular over a long series of years?—They are on the whole; I should think they are, yes.

2525. Your sales of the 6-inch map are increasing?—They have increased; I do not think they are increasing, because the survey is finished.

2526. And the augmentation of the sale which was due to the increase of publication has now become normal?—Yes, probably, sir.

2527. And I suppose the same would apply to the town plans?—It would, sir, after they have been out a little while. There is always a rush directly they are issued, sir; there is a little demand for them then, and then after that they drop.

2528. Apparently by this return it may be said that you sell the same amount in value of town plans as you do of the 1-inch. Of the 1-inch map the sale is about 2,000 a year, the 6-inch map about 4,000 a year, the 25-inch map 7,500 a year, and the town plans approach 3,000 a year?—Presumably so, sir; I do not know those figures, but I take it that is so. They are my figures, I expect.

2529. (*Mr. Mather.*) What means has the Ordnance Survey Department of knowing whether their productions are satisfactory either in execution or in form or in paper, if you, as the sole channel through which their publications reach the public, are not able, either under your contract or for some reason or other, to represent the public opinion on these productions?—Well, sir, if the maps are not satisfactory in a good many cases customers will send direct to the office.

2530. What office?—To Southampton.

2531. But has anything transpired between you and the Department to make it a delicate matter for you to refer complaints to them that come to you from your customers?—I have always had scruples against worrying the Department, sir.

2532. Oh, worrying, I quite understand; you would not worry anybody. Complaints you yourself to-day have pointed out to us as coming to you from your customers, and also which you yourself have recognised the importance of. If those have not reached the department, how can they mend their ways or mend their maps?—If there is anything I consider sufficient I send it on to Southampton. If a gentleman writes to me to say the map is so-and-so, and so-and-so, and I think the Ordnance Department can in any way alter it, I send the letter on.

2533. Then there is no obstacle of formality or red tape which has prevented you from coming into close contact with the officers of the Department, and informing them what the public require?—Oh, no; I consider I worry the Department too much in a good many ways; I do not wish to worry the Department so much as I do.

2534. That is scarcely in accordance with what you said just now, that you regarded yourself as being only the agent receiving from them what they sent you, and disposing of that without remark?—So I am, sir; but that has not always prevented me from writing to them. In 1889 I wrote a long memorandum about indices.

2535. The fact is they welcome any criticism of a reasonable character you make upon their productions?—I should send any communication I thought desirable.

2536. The Department have not put any obstacle in your way?—Oh, no, the Department have not.

2537. (*Chairman.*) I believe you think the indices might be improved?—Yes, sir.

2538. You want a separate index for the 25-inch map, for the 6-inch map, and for the 1-inch map?—Yes, sir.

2539. And at present the same index serves both for the 25-inch and the 6-inch?—Yes, sir, I believe it does.

2540. That is a town index?—Yes, sir.

2541. Is that a satisfactory index?—That is of one town; that I should consider is a satisfactory index, except in this particular that it does not give the scale in English, it gives it in fractions—"Index to the 1/500."

2542. And you say that should be done?—That should be, I say, as they have got it here. The index scale is 6 inches to the mile; but this is 1/500. The ordinary individual does not know what 1/500 is; he has not a notion.

See Wilson,
p. 221.

2543. It does not say a 1/500 of the full size?—No.

2544-5. It simply says 1/500?—Yes. I should hold to a scientific description; but I think you ought to have something for the general public. I believe this index map of Manchester was issued in eight sections originally.

2546. (*Lieut.-Gen. Cooke.*) This individual map?—That individual map.

2547. (*Chairman.*) That is Manchester?—Yes.

2548. (*Lieut.-Gen. Cooke.*) On the same scale?—I believe on the same scale, sir.

2549. (*Chairman.*) Is it objectionable that it is so large a scale;—Oh, no, that is quite right size; but the sections; that particular map is an instance I have brought with me. This is how I got, or used to get it.

2550. That showed you how much of the survey was completed?—That does not show me anything any more than this one does.

2551. They issued this index in parts as the Survey was completed?—Directly the first sheet is out, sir, I want the whole index.

2552. You say they ought not to have issued an index for any portion of the town; they ought to issue an index for the whole, showing how much is published?—No, I say they ought to let me have an index which I can send to my customers and say there is a certain part published, and the rest all round it will be for the whole city, so that I can send it to the borough engineer, and that he can order a complete set of one directly the first sheet is published.

2553. (*Mr. Mather.*) He knows the others are coming on?—Yes.

2554. (*Lieut.-Gen. Cooke.*) This index is based on the 1/500 plans; therefore to do that they would have had to take an incomplete map to make the index. This index is based on the maps after they are completed; I think, therefore, to do what you want you would have had to take a temporary incomplete plan and put the sheet-lines on it?—I do not know how they work, sir; I cannot tell you, but the great inconvenience we have in a town like Manchester is this, the sheets that are out we colour in red and send them to the borough engineer, and then he orders the others. He can order the lot or any one he wants; directly that comes out we send to him.

2555. You say that the index should not wait till the town is completed; but you should have an index which may be got from an imperfect plan, which shall show you the sheet-lines and the state of the survey if you want it?—We only want an index, sir, just to give us the sheet-lines and a rough outline of what is going to be put in it; we want nothing more than that; but it is a nuisance to have eight or nine sections of a thing like that.

2556. (*Chairman.*) Well, then we come down to the 25-inch indices. At the present moment they are shown on the same index as the 6-inch by interior lines, and there is some difficulty to the uninitiated in distinguishing which are 6-inch and which are 25-inch sheets; is that so?—Yes.

2557. And that difficulty would be got over if you had a different index for each?—Yes.

2558. (*Mr. Roby.*) Have you found that difficulty very serious?—Well, we have not found it so serious in these indices as we have in the big county indices, which we use more largely than anything else. May I show you what I mean? These are the ones which we use largely, because a customer sometimes does not know whether he wants a 6-inch or a 25-inch; he does not know which he prefers. Well, we send him an index like that (4-mile index of the West Riding of Yorkshire showing civil parishes), and he cannot make anything out of it; I defy anybody who is not up in the thing to make anything out of that index at all, to order a sheet by its number; it has no explanation on it.

2559. (*Chairman.*) That is what you ordinarily show in your shop?—That is what I ordinarily show in my shop.

2560. And this has been supplied to you by the Ordnance Survey Department?—That is a recent thing, only issued last week or so.

2561. It does show the 25-inch?—It does show it on this one; there is an index (4-mile index to the East Riding of Yorkshire showing civil parishes), 1891,

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which shows the 6-inch there; but on this one, the West Riding index, there is not.

2562. (*Lieut.-Gen. Cooke.*) You would not have the 1-inch sheets shown on this would you; you think it confuses it?—I should not if this is meant to show the 25-inch survey.

2563. The West Riding of Yorkshire index is meant for the 6-inch not the 25-inch survey; you say there is no numbering to the 25-inch survey, it is meant for the 6-inch?—But you could reckon it up, sir, from the 6-inch sheets.

2564. There is no reference to the 25-inch in the index to the West Riding?—There is no reference to the 25-inch at all, but it is meant for the 6, 1, and the 25-inch scale.

2565. Do you say that there should be a map of the county showing the progress of the 25-inch sheets. We have got here a map showing the parishes; but there is nothing for the whole county showing the progress of the 25-inch?—It is almost all issued now, so a map showing progress is not wanted; it is only that you have to give the sheet-lines without confusion.

2566. (*Mr. Mather.*) You want an index sheet with the lines for each map?—It is what I suggested in 1889 that the Ordnance should do, and they have done it to a certain extent. This shows the 6-inch (3-mile index of Norfolk produced); I do not know whether they have adopted my suggestion, but it is my suggestion, to give each number of the 6-inch only.

2567. (*Mr. Roby.*) This map you produce of Norfolk is an index to show what?—To show the maps on the 6-inch scale only.

2568. This map is also coloured to show several parishes, is it not?—Yes, sir.

2569. But for the purpose of the index would you think it better without colour?—Better without colour.

2570. (*Chairman.*) We might take it this way Mr. Stanford, that you are distinctly of opinion that there should be a separate index for the 25-inch showing no other lines but the 25-inch map, another one for the 6-inch, and another one for the 1-inch?—Certainly.

2571. And that neither map should show any lines belonging to other maps?—Certainly, sir; that one (3-mile index of Norfolk, with 6-inch sheet lines in red and coloured in parishes) is a recent one they have issued. That is my suggestion of 1889; I do not know whether they adopted it or whether it is their own.

2572. Would you publish this with all these colours on the index map?—We get all these as index maps; that is an Ordnance map and it is issued officially.

2573. A customer coming into your shop and asking for some sheets for the 6-inch map of the county of Norfolk, would you prefer to put this map before him in colours or in black only?—Well, if he wants the parochial divisions, of course it is better as it is in colour, but as a rule they do not go by parishes on the 6-inch scale. They do not want the parochial divisions; they only want it uncoloured, that is my idea.

2574. Yes, but as an index map, putting aside the extra expense of colouring, you think that is quite as satisfactory?—I think it is satisfactory as regards the 6-inch, if it had not got all that table of areas.

2575. You think that is quite unnecessary?—I think that might be put in book form, so that we should not have such an unwieldy sheet to deal with.

2576. (*Lieut.-Gen. Cooke.*) Would you prefer these numbers and lines to be black or red?—They ought to be red. I have another objection to that; this map (3-mile index of Norfolk) is 6d., and this, the same thing, is 3s.; only that (the 3s. edition) has not got the sheet-lines on it.

2577. Why is that?—I do not know.

2578. What is the difference?—This has not got the sheet-lines and that has, and that (the 6d. edition) is on a little lighter paper than the 3s. edition.

2579. This is published for an index and that is a county map?—That on thick paper without sheet lines is 2s. 6d. uncoloured; the price of the index, coloured, is 6d.

2580. (*Mr. Roby.*) I suppose the index has been reduced in order to meet the necessary wants of the public?—The Ordnance Office cannot produce that for 6d. I should not think so.

Mr. E.
Stanford.

26 May 1892.

Mr. E.
Stanford.

26 May 1892.

2581. (*Mr. Primrose.*) And does the less expensive index contain all the details that are on this more expensive map?—No, sir, it does not contain so much; it does not have the sheet-lines.

2582. On the one that has the sheet-lines there is no detail omitted?—There is no detail omitted.

2583. (*Chairman.*) The two things are absolutely the same as regards the map, only the one is sold because somebody wants to buy it and the other is sold because somebody wants an index and the paper of the former is a little better?—Yes, a better paper; it is quite a recent index within six months.

2584. Is there any demand for these maps?—A little, sir, not much; they are just out—these indices.

2585. They are not known of?—They are not known of yet.

2586. Should you think that is rather a wide line (referring to table of areas of parishes on the edge of the 3-mile map of Norfolk)?—I think those, sir, should be issued in another form.

2587. Is it desirable that the Ordnance Survey should issue maps of all scales, Mr. Stanford. Up to the present time the Ordnance Department is limited pretty much to the sale of maps of 1 inch and upwards. Now here is a map on the scale of 3 miles to an inch?—Yes, sir.

2588. Is it desirable that they should go into that business?—I should not have thought it was, sir.

2589. You think that should be left to the ordinary map publisher?—I think so, sir.

2590. (*Lieut.-Gen. Cooke.*) You would say 1 inch is the lowest scale on which the Ordnance Survey should publish, would you?—I should think so, sir.

2591. (*Chairman.*) Has this map (3-mile map of Norfolk, 3s.) been issued in answer to any demand by the public?—I do not believe it has. I cannot say anything about this map.

2592. You will not get anybody else to publish it, with parishes?—You will not get anybody else to publish it with parishes, no.

2593. There is nothing of yours that competes with this?—No, there is nothing of mine that competes with this Ordnance Survey map of Norfolk.

2594. There is nothing of yours that competes with this?—No, it is quite distinct.

2595. Have you any map of your own 3 miles to the inch?—Yes.

2596. Would not this compete with it?—No; it is an old map, mine.

2597. The effect of publishing maps like this would be to extinguish map-making in England by private individuals?—It would injure it to a certain extent, but it would not injure it if we were all at liberty to use the Ordnance maps—I do not say to reproduce them exactly but to use them; we do not feel all of us at liberty. They put on the maps they reserve all rights, and we do not always like to reproduce them. In my own case I have not reproduced Ordnance maps for that reason.

2598. You have not yourself published any maps calling them reduced Ordnance, or used any name, including the word Ordnance, which might lead the public to believe that you were issuing Ordnance maps?—I have not issued any such maps, sir.

2599. It has been done by others?—Yes.

2600. Do you think the name of Ordnance ought to be permitted to maps on the $\frac{1}{2}$ -inch scale, say, which have been reduced from the Ordnance maps?—They ought not to be allowed to use the word Ordnance. If they say reduced from the Ordnance Survey maps, there is no objection to it I take it, but reduced Ordnance means an official publication below the 1-inch, and ought not to be allowed, in my opinion.

2601. (*Lieut.-Gen. Cooke.*) You would merely add the words, "from the Ordnance Survey," "reduced from the Ordnance Survey"?—I take it that is legitimate; I think they have a right to use them.

2602. (*Chairman.*) You object to this table of areas on the index maps; do you also object to it as a map for sale to the public?—Do you mean as a separate map, sir? Yes, I should object to it. I do not think anybody would care to mount that sheet as it is.

2603. Now with regard to the 1-inch index; is the outline of England which is used for that index map sufficiently accurate to enable you to tell what sheet you want?—Well, sir, I learned last week that the outline was not accurate, but it is sufficiently accurate for my purpose.

2604. Are there enough names printed on that index? For the 1-inch map?

2605. Yes?—Well, I think it would be very desirable to have one name in each quarter sheet, if possible.

2606. Have you any other remarks about indices?—I wish to add in connexion with these indices, they put how much the sheets are; they are not always correct on those indices.

2607. You mean the price?—Yes, sir.

2608. (*Mr. Roby.*) Has there been any alteration of the maps since that index was issued?—I believe not, sir; indices like that for 2s. 6d. are not generally liked.

2609. With regard to the map-making then of the new 1-inch maps, you have sold some of the new photo-zincographed advanced publications, I daresay?—Oh, yes, sir.

2610. Have the public grumbled at them?—Yes, sir.

2611. As not being pretty enough?—Yes, sir.

2612. With regard to the engraved sheets, are you satisfied with the engraving of the new sheets?—Yes.

2613. Are they as good as in the old 1-inch map?—Well, you can hardly compare them; the old 1-inch map showed the forms of the ground in a way that the new 1-inch does not.

2614. Some sheets of the new do?—Yes, the hill-shaded ones for instance. When I spoke I was not thinking of the sheets with the hills.

2615. You were thinking only of those that were published without hills?—Without hills, yes, sir, there are not many sheets issued with hills at present.

2616. (*Mr. Roby.*) Of the new series?—Of the new series, but I was thinking of the original editions of the old 1-inch of which I have got some copies, which are very beautiful.

2617. (*Chairman.*) Which are very beautiful?—Yes.

2618. Those in good condition?—Those in good condition are very beautiful.

2619. (*Lieut.-Gen. Cooke.*) I suppose the Snowdon sheets are as good as any. Do you know the Snowdon sheet?—I do not know that, sir, in the original editions, but I have got all the south coast of England in a very early state, and they are very beautiful. Those sheets of mine do not go so far as Cornwall, but I should say these new sheets with the hills are quite as good, I see nothing against them at all.

2620. (*Chairman.*) Are the different classes of roads sufficiently distinctly shown on the new engraved sheets?—Well, that is a question I do not know much about; that is an engineer's question, with which I am not sufficiently acquainted.

2621. Do you think our new map compares favourably with the foreign productions?—Do you mean this new 1-inch with hills.

2622. Yes?—Yes.

2623. Do you know the French vicinal map?—Yes, I know the French vicinal map.

2624. That is printed in colours?—Yes.

2625. Do you think it is preferable to ours?—For ordinary use I do not think it is.

2626. You do not think we should adopt colour for our maps?—I do not think we should on the 1-inch scale; you want to use them for so many things, and you want uncoloured sheets for your purpose.

2627. Supposing the hill-shading were printed in colour, would it make a 'nicer map?—Presumably it would; I think it would probably; I think the world would like it better probably.

2628. Criticise this French vicinal map. Why do you not like that; what are your objections to that map?—Of course if you want to put other work on to that it is rather objectionable.

2629. (*Mr. Roby.*) But you think this brown colour for the hills is preferable to having the hills done in black?—For my own use I would rather have a black map.

2630. (*Chairman.*) Altogether?—Yes.

2631. (*Lieut.-Gen. Cooke.*) I suppose one of your objections to the French vicinal map is especially that there is so much colour on it that if you wanted to use it for practical purposes, collecting information or laying down work, it would be very difficult to do so?—It would, sir.

2632. Is that your principal objection?—That would be an objection. I have not studied this map at all to look into it. I think that it looks nice; but I do not think that it adds to the readableness of the map. The majority of the world likes a little colour, sir; we find in map-making.

2633. (*Mr. Roby.*) Do you not think where the shading is very heavy that if the hills were put in brown they would be able still to read the names of the places clearly through it?—I daresay you would, sir.

2634. (*Chairman.*) Now would you tell us what are your objections, as a map-maker, to the French vicinal map; would you criticise that map, Mr. Stanford?—I should say for ordinary uses that is much too full.

2635. Much too full?—Yes. For an engineer who wants particulars of roads and that sort of thing I should think it is admirable.

2636. Would an engineer get more information out of that map than from our 1-inch?—Well, I should think he would probably—I mean if he wanted roads and that sort of thing.

2637. The quality of roads is more distinctly shown?—Yes, the quality of roads is shown; but I should think for ordinary uses the ordinary individual who wanted to walk about with that map would find it too full—the ordinary tourist; that is my idea.

2638. I believe that is a cheaper map than ours?—I do not know what it is published at.

2639. (*Mr. Roby.*) Do you think the paper on which this is printed would be sufficient?—For our 1-inch map, sir?

2640. Yes?—I do not think it is good enough; I should not say so.

2641. And is there more or less difficulty in mounting a map on paper like that compared with our 1 inch Ordnance, taking the paper only?—Oh, there is no more difficulty—about the same difficulty; but the result is not so satisfactory.

2642. (*Chairman.*) Have you noticed whether our 1-inch map has as many names as this old 1-inch map?—I have not noticed, sir.

2643. You have heard no criticism on it?—I have heard no criticism, but I should think the new map has more.

2644. The new map has more names?—I should think so.

2645. (*Mr. Roby.*) I would just ask with regard to the sale of maps, do you find all three the same, 25-inch, the 6-inch, and the 1-inch, or is your sale chiefly of one or other of these maps?—Oh, no, sir; all of them very mixed.

2646. (*Chairman.*) How could the publication of these Ordnance Survey maps be better brought before the notice of the public than it is at the present time?—Well, sir, what I should like to urge is that the index maps should be made gratis. I think that would help the maps very much.

2647. The other question is whether booksellers in certain county towns could have the maps on sale and return?—That is the only other way that I can see that would have a distinct influence on the sale.

2648. The public at present are not thoroughly informed of these excellent maps which they can get?—They are not, sir; it is difficult to reach them, and when you do reach them they do not understand what you mean—I mean I send out advices for all new sheets as they come out to anybody that I think suitable in the directory.

2649. You spend a good deal of money in postage and distribution?—I spend a good deal of money, sir, and the result is not worth the candle as a rule—the direct result. The purchaser often goes to the bookseller instead of to me, but I do not object to that.

2650. Do you suggest that those indices should be posted up in the post offices?—If you get an index that anybody can understand, sir, certainly; but it is not

any good issuing any indices like the ones I have produced where all the scales are mixed.

2651. We have that on our evidence, that you think there should be a separate index for each?—Yes.

2652. And that then they would be intelligible?—I think so, sir.

2653. And then I suggest that they might be put up in public places, such as post offices?—Yes, sir.

2654. Say these maps might be had through the booksellers?—Certainly, there is no objection to that.

2655. And you think then the sale would be largely developed?—I think it would be developed, but I do not think it would ever be largely developed unless you could get the booksellers to keep stock, and they will not keep stock.

See Wilson,
p. 222.

2656. Not upon present terms?—They have not got the room, and they will not lay out the money in the necessary furniture—I mean to keep the maps in, the necessary drawers, &c. which are wanted.

2657. Yes, but a local bookseller would only be required to keep stock for his immediate neighbourhood, for his own county, or half his county. That would not require any very large amount of space, would it?—He would want a case as large as that table down to the ground.

2658. For an ordinary county?—Yes, if he had all scales. A bookseller will not spend the money on it.

2659. And that is a great obstacle?—A great obstacle.

2660. You would not suggest that the Ordnance Survey should set up a shop in every town, I suppose?—I should not suggest it, sir.

2661. And how could the difficulty be got over then, if the bookseller will not keep stock and it cannot be made his interest to keep stock; and the Ordnance Department is not to set up shops; how can you get any further than we are at present?—Oh, I think if anybody wants the maps he can get them, sir.

2662. If indices in full were put in available places where the public could see them, then you think they would apply direct to central agents to get them?—I think so, sir.

2663. And it may be made worth the while of central agents to keep some such stock and supply readily?—I think it should be, sir.

2664. (*Mr. Roby.*) I suppose with regard to that stock to be kept by the local bookseller, the locality would be only for the 6-inch and the 25-inch, but for the 1-inch he would require many other parts of England, would he not, to meet the views of tourists?—Oh, certainly, in Leeds you would want the whole of England.

2665. (*Chairman.*) Have you seen this new 4 miles to the inch map?—Yes, sir.

2666. Has that map any sale?—Well, it has only been out about six or eight weeks, sir.

2667. Do you think it is a desirable map to publish or not?—I have only just been able to publish my index of it showing the sheets.

2668. It is a very old map, I believe?—It is a recent map, sir, just published.

2669. But it is not up to date?—Oh, I believe not, sir, except as regards railways.

2670. (*Mr. Roby.*) It is taken from the old survey, is it not?—From the old survey; it states so on the map.

2671. (*Chairman.*) Do you think it is objectionable to have published an old map?—Certainly, most objectionable.

2672. That they had better not have done it?—Certainly.

2673. Notwithstanding it was asked for for certain purposes?—I do not know about that, sir.

2674. Did not you yourself ask for it?—I asked to be allowed to use it for an Antiquarian Society to use transfers.

2675. You asked to use transfers for it?—The transfer of one county was all I asked for; it happened to be the exact scale, and to give sufficient information on it for this use, and I asked to be allowed to use it and I was allowed to use it.

See Wilson,
p. 222.

2676. Your demand was limited to that one small piece of it?—Just that little bit of it.

Mr. E.
Stanford.

[26 May 1892.]

2677. Did you know that any other people wanted sheets of it?—No.

2678. (*Lieut.-Gen. Cooke.*) As this present map that has been published is obsolete, you would not think it desirable that the Ordnance Survey should go to the trouble of publishing a new correct 4-mile map, but you would rather leave that to the trade, would you not, according to your former evidence?—I would rather leave that to the trade, yes, sir, if we are allowed to do it.

2679. (*Chairman.*) There is an official catalogue published—a large book—there it is; is that a useful publication?—It is very useful to us, sir.

2680. It is essential to your business?—It is essential to my business.

2681. But not for the general public?—No.

2682. The public would not understand it?—Oh, I think they would, sir.

2683. It is worth continuing that publication?—I think you must have something, sir, you must have a catalogue of some kind.

2684. Could you suggest any improvement of that catalogue?—Well, I have got one I should like to suggest; I have got it with me, that a list like that in the county catalogue of Nottingham should be added to each county.

2685. This is a publication of the Ordnance Survey?—This is a publication of the Ordnance Survey, sir; on one page they give every sheet of the 25-inch sheet of the county of Nottingham.

2686. Does not the catalogue do that?—The catalogue gives it, but you have to search for it and you cannot find, probably, the parish under which it is.

2687. You think then that the catalogue if published in that form for every county would be better?—It should be in addition to the existing catalogue, one page should be added to each county.

2688. (*Lieut.-Gen. Cooke.*) Added to what of each county?—Added to this. You see, sir, the object of it is this, when a customer writes to a bookseller and orders certain sheets the bookseller is not able to find out how much those sheets are without wading through the whole county if he does not know the parish. If he does know the parish it is all right, but if he does not know the parish he has to go through all these and discover that particular sheet which he wants.

2689. This localises it into counties, he would only have to go through the county?—As regards the 16 divisions of each sheet. It is that page 41 of the Notts County Catalogue which I want added to the existing catalogue; that gives the sheets in their proper order, and the sheets that exist. It would be extremely desirable, if you make the 25-inch index, that you should print that on the back, and then you would not want the catalogue at all. Then, as regards the existing catalogue, it would be very useful and interesting if they could put under each parochial name the date of survey.

2690. The date of survey should be put in the official catalogue?—The date of survey should be put in the official catalogue.

2691. To each what; to each parish?—Yes, because there are considerable discrepancies, even in the same county.

2692. Do you think there would be any way of showing to the public the progress of the survey?—That is already done in the Blue Book, sir.

2693. No, I mean in a more extended form, showing how much of the parish or county was done?—You can only do that by red colour or some colour, sir, as I do in my little 1-inch index.

2694. You have it, of course, in your office, and you supply copies of it when it is asked for?—Yes.

2695. But could the Ordnance Survey do anything towards improving the information?—I do not think they could do very much, sir, towards that—I mean the majority of the maps are now published, and there is only a little remains to be issued.

2696. (*Chairman.*) Just that southern band across Lancashire.

2697. (*Lieut.-Gen. Cooke.*) And there are these counties in Scotland?—Oh, yes; I was only thinking of England and Wales, there is Lancashire and Yorkshire. Of course, you see, if anybody writes to us we send them the index up to date; we put in the work by hand in red colour.

2698. (*Chairman.*) You say that the indices for the unsurveyed portions of the counties should be published before the completion of the survey?—Yes, sir.

2699. Well, should now be published in fact?—Yes.

2700. (*Lieut.-Gen. Cooke.*) Based on the best information to be obtained?—Yes.

2701. (*Mr. Brickdale.*) Do the maps now published contain information as to where to get them?—They do not, sir.

2702. Do you think it would increase the sale if they did?—Certainly.

2703. (*Chairman.*) Would you print on the bottom of the maps, the maps may be obtained from Messrs. Stanford?—Yes, sir.

2704. Or, "Messrs. Stanford are Government agents," or "All applications for maps should be made to Mr. Stanford"?—I think all three names ought to be put on the map, sir, the English, Scotch, and Irish names should be put on all the maps.

2705. You would put the three agents' names on all the maps?—Yes, sir.

2706. Official depôts for the sale of Ordnance maps exist at Messrs. Stanford, London; Messrs. Menzies & Co., Edinburgh; and Messrs. Hodges, Figgis & Co., Dublin?—Yes, sir.

2707. And that would be a useful addition?—Most useful.

2708. (*Lieut.-Gen. Cooke.*) Would you put more detailed information, such as Messrs. Stanford, Charing Cross, London?—You should put the address.

2709. The names of the three official agents and their addresses should be printed on all Ordnance maps?—Should be printed on all Ordnance maps.

2710. Do you regard the present arrangement as sufficiently permanent to justify that?—I am hardly able to answer that question, sir.

2711. (*Mr. Primrose.*) The Scotch agent has only recently been changed?—Yes.

2712. I think his contract is only for five years?—I do not know.

2713. Well, that would have made the information incorrect in respect of the whole edition?—I thought he resigned.

2714. It may have been that he resigned?—I am not quite sure what it was.

The witness withdrew.

Adjourned till Tuesday, 31st May 1892, at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

EIGHTH DAY.

Tuesday, 31st May 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
 Lieut.-Gen. A. C. COOKE, C.B., R.E.
 Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
 Mr. HENRY JOHN ROBY, M.P.
 Mr. CHARLES FORTESCUE BRICKDALE.
 Major DUNCAN A. JOHNSTON, R.E., *Secretary*.

Mr. GEORGE HARVEY JOHNSTON (Messrs. W. and A. K. Johnston) called and examined.

Mr. G. H.
 Johnston.

31 May 1892.

2715. (*Chairman*.) You are a map engraver and publisher residing in Edinburgh?—Yes.

2716. Have you directed your attention to the Ordnance Survey maps?—Yes.

2717. On all scales or only on one scale?—On all scales; they all pass through my hands.

2718. Have you any observations to make on the large-scale town plans—the 1/500?—No; except the general remark that all scales seem too dear, unnecessarily dear; but whether it is desirable to make them cheaper is of course a secondary question.

2719. (*Mr. Roby*.) Too dear to get a large sale from the public?—Yes.

2720. (*Chairman*.) What is the price of the 1/500 sheet?—Half-a-crown.

2721. Uncoloured?—Uncoloured, and the price goes up to 15s., I think, coloured.

2722. If these maps were hatched instead of coloured they could all be sold at half-a-crown, could not they?—They could be sold for less, I think, than that.

2723. You think half-a-crown is too much for the uncoloured map?—It seems an unnecessarily high price, but still the gain of the Survey to the private individual should be taken into account perhaps.

2724. If the maps were hatched would they be as good as if coloured?—I should think so, in a general way.

2725. You have found them correct in surveying?—Yes, so far as they go; but they are nearly all behind the times, and are not up to date.

2726. Except for want of revision, they are correct?—I think so.

2727. And would satisfy every requirement of the public if they were kept up to date?—I think so, yes.

2728. Will your remarks as regards price equally apply to the 25-inch?—I think so.

2729. And there again if the buildings were hatched, expensive colouring might be got rid of?—I think so, but the colouring of course is an advantage. If you can reduce the price of the maps, if you can make them sufficiently cheap, the coloured map is more attractive and generally more useful of course. If you are going to charge such an enormous price as 15s. for it, it is ridiculous; it kills the sale, at all events from the popular point of view.

2730. Do you think that the additional cost of colouring over the price of the map uncoloured is unreasonable and excessive considering the amount of coloured work in the map?—I think so. I think if the colours were printed and larger editions issued, they could be issued much cheaper. They are hand-coloured, I understand, just now.

2731. The colouring of course would require another plate and another printing?—Not necessarily, if they were printed from the stone by lithography.

2732. You would do the whole map then at one operation?—No, you would require several printings, of

course; but you would not require additional plates. The work could be polished off the stones after it had been printed.

2733. (*Lieut.-Gen. Cooke*.) Do you think that in the 1/500, if you print from two stones in order to get the colours, you would always get the coloured one to register perfectly?—Oh, certainly; we do it every day.

2734. On sheets of the size of the 1/2500?—I think so.

2735. Of course the size makes a very great difference?—Of course; but still we are so accustomed to that work. We do it every day. These are some sheets which we have done (sheets from the Royal Atlas, printed in colours).

2736. (*Mr. Mather*.) Have you used this process for filling in sheets of the size of the 25-inch town maps?—We have, even for larger maps.

2737. For showing the blocks of buildings?—Yes, that can easily be done. Half strength of colour we get by means of dotted plates, that is to say, the plate is engraved in dots, so it represents only half the strength of colour when printed, and we print the colour solid when we want additional strength.

2738. What advantage do you expect to get from colouring maps by that process as compared with having them hatched?—They are more attractive, and more easily understood by the uneducated public.

2739. More easily understood than with the hatching?—Yes, I think so.

2740. (*Chairman*.) Are you acquainted with the process used at Southampton?—Zincography; yes, I know it generally.

2741. Do you think it has advantages or disadvantages as compared with the use of the stone?—Well, I do not think you get such a good impression from the zinc as you would get from the stone—not so black.

2742. (*Mr. Roby*.) But the storing of a large number of stones would be impossible, would it not?—You do not require to keep the stones.

2743. (*Mr. Mather*.) You keep the plates?—Yes, and we use the stones as we want them and polish them off afterwards, so we do not require a large stock of stones.

2744. (*Mr. Roby*.) You keep the plate, not merely the paper impression?—Yes, we keep the plate.

2745. (*Chairman*.) You think the Southampton process is not the best process that can be adopted?—I think not. I think lithography better on the whole.

2746. Of course you are aware of the reasons which have been put forward for adopting that process in preference to lithography?—I understood the principal objection to lithography was the stock of stones.

2747. And in consequence of that advantage the better technical process was abandoned in favour of the zinc?—I presume so.

Mr. G. H.
Johnston.
31 May 1892.

2748. And you do not think that hatching would altogether be a satisfactory substitute to the public for the colouring of maps?—I think the colouring is better, as I say, for the uneducated public, who do not understand a map so well as we do.

2749. (Mr. Roby.) But do the uneducated public use the town plans and the large plans much?—Not very much. Of course they are principally used by engineers for drains, &c.

2750. Is not the colouring a distinct objection to the maps in the hands of persons who want to colour them for purposes of their own?—That I could not answer exactly. I think it might be sometimes.

2751. (Mr. Mather.) You are speaking of the effect of the maps on the purchaser, especially the unlearned purchaser?—For general purposes I think a coloured map is better than an uncoloured one.

2752. (Lieut.-Gen. Cooke.) I suppose if the map was printed in colour, as you suggest, you would also have impressions printed without colour for those persons who wished to have them?—Certainly; you might have so many per cent. of an edition.

2753. (Chairman.) Do you keep any stock of both classes of maps, both coloured and uncoloured?—Yes.

2754. And which do the public ask for?—The coloured ones are generally preferred. You see they are clearer to begin with. We do not keep a large stock because we are no longer agents for the Ordnance Survey.

2755. Have you any observations to make on the 6-inch map?—Of course, there is the price question again.

2756. Was the price of the large sheets at half-a-crown excessive?—I think so.

2757. What price do you think the large size which is printed from the copper-plate ought to be sold at?—That I could not answer right off, but if you were to print them from the stone I could give you the price of that.

2758. If printed from the stone?—I should think that might be sold for 3d. or 4d. each. I have an estimate here for the 6-inch—that is, 39½ by 27 inches—and they could be sold, I should think, for 2d. or 3d. even, that is to say, provided you do not want a profit on them, which I suppose does not apply to a Government map.

2759. (Lieut.-Gen. Cooke.) What is the cost of the paper?—I do not know what you buy your paper at.

2760. What would you put it at printed on thick paper like the Ordnance 6-inch map?—We think that an unnecessarily expensive paper.

2761. (Mr. Roby.) By 3d. or 4d. you mean simply the cost of the working and of the paper?—I mean the cost of the paper and the printing only—nothing to do with surveying, or engraving, or correcting; that, I suppose, you must have for military purposes in any case.

2762. (Chairman.) That estimate is supposing a paper was used which you think sufficiently good?—Certainly, because if any man is going to use a map very much he will get it mounted on cloth, and when a map is once mounted it does not matter in the least what paper is used; the cloth swallows it up, so to speak, as regards strength.

2763. (Chairman.) The paper used at present is too thick, in your opinion?—Too good in quality, not necessarily too thick.

2764. (Mr. Mather.) The cost would be about three farthings per sheet with paper such as I showed you?—Yes. Here is a thinner, tougher paper which would do equally well (the witness produced a specimen of paper). We get that paper at 3d. a pound for a ream of 510 sheets.

2765. (Mr. Roby.) How many sheets to the pound?—(Witness produced a sample of paper at 3d. a pound.) A ream of 510 sheets weighs 90 lbs.

2766. (Chairman.) Do you think that the paper on which the 6-inch map is now being printed has any advantages over the paper that you suggest, which would justify its use considering it is so much more expensive?—I think not, and I think you use unnecessarily large margins; you waste a considerable amount of paper. The margins are very large, sometimes 4 inches or more, and that must tell over a large edition of course.

2767. (Mr. Roby.) Is the paper you use good for drawing, sketching, and so on?—I think so.

2768. (Mr. Mather.) Do you think the impressions made on your paper from the engraved plate or from the stone are as good as those made upon the paper the Ordnance Survey use?—The impressions from copper-plate always look better, but as the ink is thicker and stands up on the impression, it is more liable to get rubbed.

2769. For practical purposes you think your process is quite as good?—Our maps are less liable to be rubbed and better in every way I think (an engraved map of Hampshire was handed to the witness). If you pass your finger over that you will find the ink stands up on it and it is liable to get rubbed and blurred (a zincograph was also shown to the witness).

2770. (Chairman.) Hampshire is a large engraved sheet and this zincograph is a quarter sheet, and that is 1s. and this is 2s. 6d., I understand?—They all seem far too dear to us. We have only gone into the prices of the 1-inch England and 1-inch Scotland and the 6-inch maps in detail, and they all seem too dear.

2771. We will pass from the question of paper of the 6-inch maps, and I will ask you whether you are satisfied with the 6-inch map as a map from a map-maker's point of view. As regards the engraved map first of all, are you satisfied as a map-maker with that map as a map?—Yes, with the old objection as to price and not being up to date.

2772. It is a good map?—Fairly good. If you will allow me, I will show you our plan of Edinburgh. At present the Survey issue Edinburgh on two sheets to sell at 2s. 6d. each, and it is very much behind the times. Our own works were built in 1878 and are not on the sheets now. How can you expect that to sell when compared with our plan of Edinburgh, which has been taken from the Survey and sells at 1s. It is taken from the Survey, and we have brought it up to date.

2773. (Mr. Mather.) By special survey of your own?—We applied to the borough engineers. These two sheets of the Ordnance map sell at 2s. 6d. each, but are not up to date, they are 12 years behind the times.

2774. (Mr. Roby.) I suppose in 12 years time your map may be a little out of date?—We revise it every year.

2775. (Chairman.) You have got the borough surveyors to give you every year all the alterations that they know have taken place?—Yes.

2776. And you have put them on to your map?—Yes.

2777. Do you think that your map is accurate for practical purposes?—For ordinary purposes; of course we do not pretend that it is so well done as the Ordnance Survey would do it.

2778. Have you detected any serious inaccuracies in borough engineers' work?—Omissions more than anything else. Sometimes buildings are not properly drawn, but we check them.

2779. Sometimes buildings are not properly drawn?—No, angles are missed out occasionally.

2780. What expense are you put to annually in examining their surveys so as to satisfy yourselves that they are good enough to put on your map?—I should think the whole annual corrections would be covered by 5l. or 7l.

2781. The survey or examining the survey?—The rough survey that we require.

2782. That does not include the drawing and correcting of the map?—I think it might. Certainly if you say 10l. that would be ample.

2783. Both for checking the survey sent in by the borough surveyors and putting those corrections on to the map?—That only applies of course to the annual corrections.

2784. A map so corrected is practically a correct map?—I think so; for all public purposes it is quite good enough.

2785. You would not like to calculate areas from it?—Perhaps not; but then people very seldom do from a 6-inch map. They do in the country districts, but not in the town.

2786. You have not attempted to correct the 1/2500 or the 1/500?—No, we do not compete with you there at all.

2787. Do you think it would be practicable to extend the method of revision, namely, by the aid of the borough surveyors, to those large-scale maps?—I should think it might be under proper inspection from

head-quarters, because the fact of a map being a Government map gives it a weight of its own.

2788. You would think that the Ordnance Department sending a surveyor down once a year to check the drawings or corrections which have been supplied by the borough surveyors would be sufficient to enable the Government to correct its authoritative map?—I think it might be so.

2789. And do you think that would be materially cheaper than the Ordnance surveyors themselves correcting their map by a regular survey every year?—I should think so. Of course, a man we would send would probably get 30s. or 2l. a week, which is a very different thing from sending up a lot of engineers and men to look after them as well.

2790. Have you found the borough surveyors that you have come in contact with competent men?—Fairly accurate for all we require.

2791. I suppose you give them a fee for the information they supply?—Generally.

2792. Is that fee included in the amount of 10l. which you have just mentioned?—Yes.

2793. You would not take those drawings and put them on an authoritative map without being checked by independent authority?—Certainly not.

2794. (*Mr. Mather.*) By being checked you mean that a proper survey must be made by men on the spot?—Perhaps a couple of men might walk round the place and test a per-centage of the additions. Let me refer to one town, Edinburgh; the advantage of employing the borough engineer is that he knows where the additions have been made so that the testing authority knows exactly where to go to, otherwise he might have to look round and find out for himself, so that trouble is all saved.

2795. Do you keep this plan of Edinburgh of yours on the 6-inch scale up to date year by year?—We do so every year.

2796. And publish a fresh edition every year?—Every year.

2797. (*Mr. Roby.*) How long has it been in existence?—I think about seven or eight years now, if I remember rightly.

2798. Do not you think there would be a much larger sale for a map in a place like Edinburgh than there would be in a great number of the ordinary towns of the country?—I do not know. Of course in the case of a very small town there is not much difficulty in getting about it, and the larger a town the greater the necessity for a plan.

2799. What I mean is that Edinburgh is a tourists' town and a great many others are not?—That is so.

2800. Do you know anything of Glasgow?—Not very much.

2801. You have not kept up the revision of the Glasgow map from year to year?—No, we confine ourselves to Edinburgh with regard to the town plan.

2802. (*Chairman.*) You think the plan you adopt with regard to Edinburgh would be equally applicable to Glasgow or any large town?—I think so, and as a proof that our plan is good, may say that the city authorities in Edinburgh use our plan to a very large extent for their own works.

2803. They use your 6-inch plan in preference to the 1/500?—They use it in preference to your 6-inch map.

2804. Have you considered the possibility of the revision of the 1/500 and the 1/2500 in the same way as the revision which you have carried out for the 6-inch map?—No; I have not considered it nearly so much, because as you see there is a great difficulty when you come to such an amount of detail as you require for the large scales; but still you cannot expect a map to sell if it is not up to date; that is our experience. You are better without it if it is not up to date.

2805. Do you think it would be possible for the Department, judging from your experience of the smaller-scale maps in Edinburgh, to adopt such a system as you have suggested for these larger maps, and to keep up the revision of those town maps from year to year accurately without great expense?—I think so, yes.

2806. As a system throughout the entire country?—I think so; if they were properly organised there would be no great difficulty in it.

2807. Year by year?—I think so.

2808. So as to issue a fresh edition every year?—I think so. We try as far as possible to make each edition of our maps last about a year only, as far as we can. We do not always hit it off.

2809. (*Chairman.*) Have you any idea what number of the maps you would sell in Edinburgh in the course of a year; what an edition amounts to?—I think we generally print 2,000 of Edinburgh.

2810. That you find is about the demand?—About that, yes.

2811. At present the large sheets show area numbers?—Yes; you put a number on them with a corresponding reference in the area book.

2812. Do you think that is desirable or undesirable?—Undesirable, because I think the book serves no purpose at all beyond giving the price or something of that kind. You can quite well give all the information on the map and save the price of the area book to the buyer.

2813. You are aware that latterly that has been the practice adopted?—I believe so.

2814. And you think it is an improvement?—Yes, because a man buys a 25-inch sheet and he has to buy an area book for the whole parish at a cost sometimes of 4s. 6d. over and above the price of the map.

2815. Do you find any demand for the area books?—Of course people have to buy them if they want to know the areas of the places. At present a man may have to pay 7s. or 8s. for the sheet and area book and he might get the whole thing, even at your rate, for half-a-crown.

2816. I will pass to another heading, viz., the contouring and the hill-shading. Do you approve of a contoured map?—Generally.

2817. Is the contouring in Scotland in sufficient quantity?—Well, of course, if one wants the exact contour one does not get it, because a great many peaks drop out between two contours.

2818. You would like them more closely contoured?—Yes. At present the hills are so black that people buy the contoured map for its clearness.

2819. The whole sheet is black?—People cannot make use of them at all in some cases. There seems to be no system of biting the plates at all.

2820. Different plates have a different intensity of shade?—Yes. I produce sheet 72 (Scotland), which I think is extravagantly hill-shaded. The tints are so dark that the names are illegible, and the public object to it.

2821. Do you find a variation in the tint of districts which are equally mountainous?—Certainly, if you mount a number of these sheets together the result is a sort of tartan, speaking from a Scotch point of view, they are so varied in colour, like a patchwork. I produce sheet 45 (Scotland), equally mountainous, the shading of which is much better. I would prefer that the hills should be printed in a different colour, in a brown colour. I produce the same sheet (No. 45) coloured to show what I mean. The lettering on a sheet so coloured is perfectly legible. I produce another form of the same sheet coloured in contours. You will see that it does not equally well show the hill forms. I have before me now two maps with the hills coloured in brown. The one is vertical hachuring from an engraved plate, done by the Ordnance Survey; the other is done by myself, by hand in this instance, and is an illustration of work I have carried out on the stone.

2822. (*Mr. Mather.*) Is this done with the American air-brush?—That is printed from the stone. It has been produced by the American air-brush, the important part of which is simply a needle that goes out and in, and a drop of ink is blown off as a spray on to the stone and produces a flat shade.

2823. Is this map of Switzerland produced in that way?—Yes.

2824. (*Chairman.*) One is vertical hachuring, and what would you call the other?—Our expression would be that the depth of colour is worked up by the air-brush, and printed from the stone.

2825. And there is no proper hachuring in it?—No. The system shown on the Ordnance Survey map is the most artistic, but it is expensive and slow. The one shown on my map is good enough for ordinary purposes, and can be executed much more cheaply and rapidly

Mr. G. H. Johnston.

31 May 1892.

Mr. G. H.
Johnston.

31 May 1892.

with the air-brush. The explanation of the Swiss map is, that the hills were originally engraved. The plate got worn out, and the hills could scarcely be seen, and we worked this map up with the air-brush; but the process is exactly the same, so that in this particular case you have both, although the effect is all got by the air-brush.

2826. Having started with an engraved plate you have ultimately come to the air-brush?—Simply because the plate wore out.

2827. Would that process be applicable to this?—Any worn-out sheet can be brought up in that way.

2828. (Mr. Roby.) In this map of Switzerland how many printings are there?—In this map we print each colour separately because it belongs to a high-class atlas, and we do not begrudge the printings, so that each colour is a separate printing; there are about nine printings on it.

2829. (Mr. Mather.) And from the stone in each case?—Yes, nine stones. Of course we do not keep the stones; we keep the original plate and work up the colours on the stone when we want to go to press.

2830. (Chairman.) I suppose you have seen the foreign surveys?—Some of them.

2830a. Can you tell us anything about them?—I have nothing to tell you, only to show the result. I have some specimens with me. I produce a Swiss Government map. Here the black has been used for Mont Blanc, which is about 15,000 feet high, and the colour shaded off down to the level of the sea, and in this country the pure black has been used for Ben Nevis, which is about one third of the height, so that the colours in our own maps are more condensed than in the maps of foreign countries. The engraving of the two maps is about equal in quality. The price of the Swiss sheet is 2 francs. It is 28 inches by 20 inches. I produce an Italian sheet of the neighbourhood of Rome, price 1s. 8d., which is 12 inches by 10 inches. It is printed in colour. Its scale is 1/25,000 (2½ inches to the mile). It is printed in four colours—the water in blue, the hills in two browns, and the names in black. It is contoured every 15 feet. It is also hachured.

2831. Do you consider it is a good map?—Yes, certainly.

2832. As compared with our 1-inch map, what do you say to this map?—I think there is an advantage in the different printings; it is really more useful.

2833. (Mr. Mather.) There is nothing published by our Department so good and complete as that?—No, I think not.

2834. (Chairman.) Do you know if this map is produced from the stone?—Yes.

2835. I put into your hand a map of the Isle of Wight, in colours, by the Ordnance Survey. This is an experiment. Do you approve of it?—Certainly; if the price is moderate, I highly approve.

2836. Taking our 1-inch map as a whole, do you consider that the qualities or classes of roads and the railroads are adequately shown?—I think they are fairly well shown, except in the matter of the railroads not being up to date. Perhaps an engineer would answer the question better.

2837. As regards main roads, bye-roads, and inferior roads, are they sufficiently distinguished in the drawing?—Speaking as a tourist I should say yes. I produce a sheet of the Austrian Survey; its scale is 1/75,000.

2838. Is this as good as our map?—No; that is coarser work.

2839. What is the price of this?—The price of this is 1s. It is about 21 inches by 15 inches. The roads are very distinctly marked; but the writing is inferior, and the whole workmanship coarse. I produce a sheet of the French *carte vicinale*, scale 1/100,000, printed in five colours. It is 16 inches by 11 inches, and the price 8d.

2840. You would say the work of this was good?—Yes, a very pretty map. The drawing of a large town on it is very distinct, considering the scale. It gives the populations of the various towns and the heights of most of the elevations, and the shading of the mountains is shown in a manner analogous to that which I have said I produced by the air-brush. I produce a sheet of the United States Survey for geological purposes on the scale of 1/62,500. It is contoured to every 20 feet, and printed in three colours. The contouring is so close as to give the hill forms. I produce also a map of Africa issued by the French Government, and have also other maps which are not Government maps.

2841. Do you think the Ordnance Survey should add to their work by publishing maps on a smaller scale than 1 inch?—I think they should, and I think they should combine the sheets at present issued and make popular district maps, taking two or three sheets and issuing them in one form. For instance, Edinburgh is on two sheets of the 6-inch Survey; they might make one sheet of that. The lake districts of Scotland, the lake districts of England, and the lake districts of Ireland might be issued in single-sheet form for tourist's purposes.

2842. Do you think they should issue a ½-inch tourists' map?—It might be smaller than that, and be sold in large quantities.

2843. What purpose would smaller-scale maps serve?—I think they would be a source of revenue to the Survey. Otherwise there would be no inducement to geographical houses to produce these small maps. The fact of their having produced them shows that the Survey does not meet popular requirements.

2844. Do you think that the Ordnance Survey Department should compete with private houses?—I think it should.

2845. Mr. Bartholomew produces half-inch maps now which I think are a good deal appreciated?—Yes, we also have a reduced Ordnance map.

2846. It would militate against your sale of these maps in future?—It might to a certain extent, but still it would give us other maps to sell which we should get a per-centage on.

2847. You think it would answer your purpose as well to have maps that you could sell although not produced by yourself, instead of having the production as well as the sale in your hands?—I think so.

2848. (Mr. Mather.) You have shown, Mr. Johnston, that the Ordnance Survey Department cannot produce maps at the same price that you can?—I say they do not; I do not say they cannot.

2849. I think you have also shown they cannot; why should they go into smaller maps when we have so many map-makers throughout the country who produce them so well?—On the latest sheets they have put "Copyright reserved."

2850. But provided that were taken away and they gave all the map-makers of the country liberty to use their standard maps, would it not be far better for the public that you should do it?—Oh, certainly.

2851. The public would be cheaply and better served?—Yes, and the maps would be kept up to date also.

Mr. THOMAS CURRIE called and examined.

2852. (Chairman.) You are manager to Mr. Johnston (the last witness)?—Yes.

2853. And you manage his map-selling department or his map-production department?—Map-production department.

2854. And you are well acquainted with the processes by which maps are produced?—Yes.

2855. Do you know the photo-zincographic process?—Yes.

2856. Do you know if it is better or worse than the lithographic process?—I think the lithographic process very much the better of the two.

2857. And more convenient?—Certainly more convenient. Of course it is zincographic printing as distinguished from lithographic printing.

2858. You are inclined to think then that the Ordnance Department have committed an error in adopting the zincographic process instead of the lithographic process?—I think so.

2859. Are you aware that one of the difficulties of the lithographic process is the bulk of the stones?—Of course I have frequent experience of that every day; but supposing you kept the originals on the zinc, and only used the stone for printing, you could thereby work

Mr. T. Currie.

the department quite well with a comparatively small number of stones.

2860. You could store the zinc plates and take a transfer from them for the lithographic process?—Exactly.

2861. You think that would be of importance?—Yes, if you print from the originals they would get worn out, but if you print from a transfer you would always have the original to fall back upon for a new edition.

2862. (*Mr. Roby.*) In what respect do you consider the lithographic process better than the zincographic?—Well, it is more easily worked; you can get a greater number of impressions from the stone, and you are printing from a perfectly smooth surface, whereas in the case of the zinc you have a granulated surface, and there is a tendency to break up the fine lines of the work.

2863. Is there a difference with regard to wetting or not wetting paper?—We never wet the paper at all. We print quite well with dry paper. Our best work is done with dry paper.

2864. Is that done with specially prepared paper?—It only requires a better finished paper, that is all.

2865. (*Chairman.*) You avoid the difficulty arising from the shrinkage of paper?—Yes.

2866. (*Mr. Mather.*) Are you acquainted with the zincographic process?—Practically.

2867. You know the method of preparing the plates?—Yes.

2868. You spoke of the granulated effect produced by the zinc plates?—There is a granulated surface on the zinc plates.

2869. Have you seen the process of polishing the plates which they employ?—Yes, they have to grain them; there must be a grained surface.

2870. (*Chairman.*) You have worked them yourself?—Yes.

2871. With regard to the paper which is used in the Ordnance maps, do you think that is better in quality than is required?—I think very much better in quality than is required.

2872. An objection was taken to a paper which was used some years ago, which I think was a little more like the paper that Mr. Johnston has shown us this morning, that it was not adapted to work out of doors under conditions of wind, damp, and so on, so the paper was changed to the stronger drawing paper. Do you think there is anything in that?—Oh, certainly; that would mainly apply to maps which were to be used in the open air; but the great majority of sheets are used indoors.

2873. You think special requirements should be met by special printing?—A very small edition, yes.

2874. And that paper might be materially reduced in cost without disadvantage to the public and disadvantage to the maps?—Clearly.

2875. (*Mr. Roby.*) Do you consider the paper on which you have printed your map of Switzerland is as good for appearance and for bringing out the detail as the paper used by the Ordnance Survey?—It is easy to print on, but you cannot bring out the detail very well (except by an expensive method of printing) on the Ordnance Survey paper. In all drawing papers an amount of size is necessarily introduced into the pulp of the paper which makes it difficult to print on.

2876. (*Chairman.*) If the quality of the paper was changed some of the maps would be on one sort of paper and some maps on another?—Quite so. That is certainly a difficulty, and, if I may be allowed, I can show you one of the difficulties we have to overcome in mounting even although the paper is not changed. This is one sheet printed from the copper-plate, and another sheet printed from the zinc plate, and there is a difference of half an inch, the zinc plate being larger than the copper-plate to that extent.

2877. (*Mr. Mather.*) Are those both printed from the zinc plates?—One is from the engraved plate and the other from the zinc plate. That is caused by the difference in the two methods of printing. One is printed from the zinc-plate transfer from the original plate, and the other is an impression from an engraved plate by the copper-plate process.

2878. You mean the zinc-plate was produced by the photo-zincographic process?—Not photo-zincography.

It is a transfer from the engraved plate, an impression from the engraved plate transferred to zinc.

2879. And in the process of transfer it has stretched, as it were?—Yes.

2880. Have you any difficulty in securing a uniform quality of paper for your maps?—No, we get it all from one mill. It is made specially for us.

2881. Year by year you get about the same quality?—We get about the same quality.

2882. You have no difficulty in using the paper you buy in one year for the purpose of an edition which you print a year or two after?—Not at all.

2883. (*Mr. Roby.*) How will it be in four or five years. Could you rely on the paper being in tolerably uniform condition?—We do not buy paper so long ahead; I could not say; we do not care to have it in stock more than three or four months.

2884. I am thinking of how a sheet printed this year would compare with a sheet printed three or four years hence?—I would undertake to make the sheets match accurately.

2885. In joining three or four sheets together, you find no difficulty as to the quality of paper?—Not if it be all one make and all made for that one purpose.

2886. Have you any independent criticisms to give us?—Well, I would strongly recommend the use of ruled plates and transferences, if you intend, as I understand you do, to print them all from zinc plates or stones. In the larger-scale town plans instead of ruling them on the plate, which is a very slow process, you could have an engraved plate to serve for the whole: one single plate would serve for every sheet of that size quite well, and when you put down the sheet in outline you have only to gum it out, as we call it, to protect the parts where you do not want the ruling.

2887. (*Mr. Mather.*) That is for colouring?—Instead of colouring.

2888. For hatching or for colouring?—For hatching blocks of buildings.

2889. (*Lieut.-Gen. Cooke.*) That is the process which is used at present?—On the 6-inch sheets the hatching is on the plate itself.

2890. No, it is transferred?—In the case of sheets that are printed from the actual engraved plate that hatching must be on the plate. That adds very much to the expense of operations and makes it more difficult to do corrections. That plan of Edinburgh of ours is engraved simply in outline.

2891. (*Mr. Mather.*) Do you consider that the Ordnance Survey Department is behind the age in the processes it employs in making maps?—Well, I think so. They could be much more quickly done on the stone—drawn on stone instead of being engraved.

2892. That is to say, if the Ordnance Survey Department were to consult the map-makers of the country as to what processes it would be best to employ in future for the map manufacturing at Southampton, they could be shown methods superior to those at present adopted by the Department?—I think so. They appeared to take a tremendously long time to make up their minds to use steam machines. We used steam machines 20 years before they were introduced into the Ordnance Department.

2893. They have got them now?—Only since 1886.

2894. (*Chairman.*) You think that lithography would be better than zincography?—Yes.

2895. Have you considered the applicability of lithography, when you have to deal with such an enormous number of impressions as are required and the enormous number of plates that are required for the 6-inch map?—There is no necessity to keep them on the stone.

2896. You would keep them as paper transfers?—You have already got the engraved plates.

2897. The 6-inch map is only partially an engraved map; a very large part of the country exists only as a photo-zincographic map and of that part of the country the zinc plates when once laid down are kept; you could not keep the stones?—I would not propose to print from those originals at all. I would simply take a transfer of them and print from the stone.

2898. You would take a transfer from the zinc plates and print from the stone?—Yes.

Mr. T. Currie.

31 May 1892.

- Mr. T. Currie.* 2899. Would printing from the stone give you a better impression than printing from the original zinc? —Well, perhaps not better, but equally as good. I understand you print from the original plate.
2900. What I understand is that a drawing is first made of the 6-inch map. It is then laid down by the process of photo-zincography, and the zinc plate is used for printing and is stored—that is for the 6-inch map, not for the 25-inch map. For the 25-inch map the prepared drawing is laid down on the zinc and a sufficient number of copies are taken; and a transfer is taken from the zinc and that is stored, and the zinc is cleaned and used again, for the 6-inch maps the zincs are printed from until they are destroyed?
- In that case, I would take the transfer from the zinc and print from the stone, especially if you have anything like a large edition.
2901. And clean the stone again?—Clean the stone, and then you would have the old original as good as ever.
2902. (*Lieut.-Gen. Cooke.*) Do you think you get a better impression by putting a transfer from the zinc on to the stone and printing from the stone than you would by printing from the original zinc?—Yes, you would get a fuller and brighter impression.
2903. You think so?—Yes, on the stone that is my experience.

Mr. G. H. Johnston.

Mr. GEORGE HARVEY JOHNSTON re-called and further examined.

2904. (*Chairman.*) We forgot to ask you about the indices of these maps. In selling to the public you, of course have to refer to indices and the public have to choose their maps from indices. Are the present indices satisfactory or unsatisfactory?—Unsatisfactory, I think.
2905. Would it satisfy you if there was a separate index for the town maps and a separate index for the 25-inch map, and again for the 6-inch and again for the 1-inch?—I think it is a great pity that the 1-inch, 6-inch, and 25-inch are not all sub-divisions of each other; that would simplify matters to a large extent.
2906. At the present moment they are sub-divisions of one another?—The 6-inch and the 25-inch are so, but they do not agree when you divide them up with the 1-inch index map.
2907. Are you satisfied with the arrangement by which you have an index of the 6-inch and the 25-inch on the same sheet?—So far as it goes; but at present I think the indices are on an unnecessarily large scale, and I think the 6-inch and 25-inch might be combined with the 1-inch as well.
2908. You do not think then that the public is puzzled as to which map they require owing to two or three indices being on the same sheet?—I think not; but they might be made clearer by having the index lines in different colours, the 6-inch lines in red and the 25-inch lines in another colour.
2909. If the indices were printed in various colours you think it would be advantageous to combine all the three indices on one sheet?—I think so, and I think they might be reduced in scale and also in price.
2910. As regards the 1-inch index, complaint has been made that there are not sufficient names on the index map to enable you to judge which sheet you require?—The danger is that if you give too much information the public will use the index map as a map without buying the survey.
2911. Have you any remarks on the town index maps?—That is the present index of Edinburgh.
2912. This is the index of the 5 feet scale plans?—Yes.
2913. I suppose that is all right, is it not?—Except in size.
2914. In your opinion, is the index map of Edinburgh too large?—I think so. I think one sheet might be issued of all the town plans of Scotland, so that instead of having all these town plans you would have one sheet for the whole of the towns.
2915. About one mile to an inch is quite big enough as an index to the town plans?—Yes.
2916. At present the index to the town map is on the 6-inch scale?—Of course in England you have more towns with large populations, but you can make two or more index sheets for them.
2917. Have you looked at this index to the 1-inch maps?—Yes, I have seen that.
2918. You think the outline of England is sufficiently good to answer all practical purposes?—Yes, as an outline, but not particular places.
2919. Is it such as the Ordnance Survey ought to print themselves?—I have had no difficulty in getting information from it.
2920. Have you the index to the parish plans and the county plans before you?—Yes.
2921. Do you like these indexes?—Yes; still they seem to be unnecessarily large. I understand that they used to be given away free, and the Department had to charge 2d. in consequence of people abusing the privilege.
2922. You think the indexes should be on a smaller scale, combined and printed in different colours so as to indicate by colours what they were indices to, and that they should be given away?—I think they should, and I think they should give no more information than is absolutely necessary to identify the sheet by.
2923. Then they might be given away gratuitously?—Yes, and I think the 6-inch, 1-inch, and 25-inch scales should all be sub-divisions of each other, and that could easily be done if the maps were printed from stone, because transfers could be made so that they would be sub-divisions of each other, and anyone would understand that 36 6-inch sheets were required to fill up one 1-inch sheet.
2924. How is that possible when printing 1-inch maps from engraved plates?—You could not do it. I am talking of lithographic printing from the stone.
2925. As regards the 25-inch and 6-inch maps, both of those might be printed by lithography as well as by zincography, and your remarks would apply to those two?—To all of them.
2926. But as regards the 1-inch map, the better part of it is printed from engraved plates?—Yes, but there is no reason for its being printed from the plates; it might be printed from the stone just as well.
2927. (*Mr. Mather.*) You wish to have the engraving transferred to the stone and keep the permanent plate and simply transfer to the stone and always print from the stone?—Then you can alter the plate whenever you like and take a new transfer whenever you go to press.
2928. (*Chairman.*) That (Barnstaple) is part of the new advanced 1-inch map of England?—That is coloured with stencil plates.
2929. Is this new advanced edition of the 1-inch map satisfactory to your eye?—Fairly so; yes.
2930. Do you think it is desirable that should be improved by being engraved on copper?—I would only get it engraved for the purpose of preserving it.
2931. For the purpose of getting transfers from it?—Oh, yes; getting corrections on the plate and keeping it up to date, and then a fresh transfer would be taken each time that particular plate goes to press.
2932. (*Mr. Mather.*) The fact is you would never use the plates direct at all?—No; just for transfer purposes. The plates get worn out in no time when printed from direct.
2933. (*Chairman.*) At the present time all the copper-plates have electrotypes taken from them which are themselves used in printing. You, I suppose, would suggest that no electrotype should be taken, but only transfers as required from the original copper-plate?—I think it would be as well to take at least one electro in case of accident to the original plate.
2935. By way of keeping a duplicate?—Yes.
2936. But it would be only by way of keeping a duplicate?—That is all.
2937. You would not use your copper as a printing means at all?—No; simply for taking transfers.
2938. Would you get as good an impression off the stone as you would off the copper?—Certainly.

2939. Are impressions from stone as good as those from the copper-plate?—I think they are very nearly as good in artistic appearance, and quite as good for all useful purposes.

2940. Are the best Continental maps with which you are acquainted produced by the process of lithography?—I should say they are about even in number, some one way and some another.

2941. What do you mean by the other way?—Some off plates and some by lithography.

2942. (Mr. Mather.) Are you aware that 6-inch maps, uncoloured, are still being sold by Mr. Stanford, the agent of the Department, at a reduced price?—No; I am not aware of that.

The witness withdrew.

Mr. JAMES WYLD (Geographer to the Queen) recalled and further examined.

2946a. You said you thought we had better have separate indices. You heard what Mr. Johnston said, that he would rather not have separate indices, but have them all on one sheet, printed with different colours?—I respectfully differ.

2947. You think that would not be sufficient?—I do not think the public would appreciate it as well. I think there would be considerable confusion in the mind of those not highly initiated if printed in colour. Of course, in dealing with the public as a mass you have not to deal with very highly educated people. Therefore the simpler the index the more easy for a person requiring a particular sheet to pick it out at once.

2948. We have had a great deal of evidence this morning about the quality of the paper. You complained that there was great want of uniformity in colour and thickness?—And quality—texture.

2949. We have had evidence that the quality now is very good, and better than is necessary, in fact that very much cheaper paper, with perhaps a better face, would give quite as good maps at much less expense. Do you think that might be the case?—There is no doubt to my mind that a cheaper paper might be supplied to the Government than is now used, and would answer the purpose as well, because paper depends on so many matters. The most important is that the face of the paper should be smooth and accurate, and that it should be of uniform quality and uniform colour.

2950. (Mr. Roby.) By quality do you mean softness, or hardness, or face?—Face is one matter. The face of a paper is separate and distinct from its quality. By processes of rolling several times in a rolling mill you can get as perfect a face on a cheap paper as you can on a very expensive paper, but the cheap papers are not sufficiently tough; they tear, they crack, and it is most important for surveying paper that the paper if it is bent by an accident should not crack so that it may be smoothed out again. Another most important matter is that the paper should be of uniform colour, and if possible of uniform production, produced under the same circumstances. Of course, you cannot produce it all at the same time, but it is very much better to print your map if possible from a paper that comes from the same mill. For instance, in publishing, say, an edition of the map of India, of which I publish, say, 1,000 copies, I am most careful to have the paper for that one edition from the same mill and from the same roller.

2951. (Chairman.) You would not like in producing one edition to use paper bought at two different times?—No, if the map consists of several sheets which have to be joined. Of course, it is perfectly immaterial if it is a one-sheet map, but there is no such thing in the Ordnance Survey because there are thousands of sheets.

2952. If you were producing an atlas?—For one-sheet maps a slight variation in the paper is immaterial; but if I were producing a map of India in four sheets, for instance, I should be most careful to have the whole printed from the same paper of the same colour and of the same quality.

2953. Will you look at that paper (handing to witness a piece of map paper marked No. 1 left by Mr. Johnston with the Committee). Would that be a satisfactory paper?—This is a cheaper paper than the Ordnance paper. There is a difference in the texture.

2943. Do you sell any of the 6-inch uncoloured maps?—That I could not tell you; our general manager looks after most of the Survey sales.

2944. Would you, as a matter of business, advise the Department to withdraw all the inferior maps they have in stock rather than sell them at reduced prices?—I think it would be the wiser policy to cancel them altogether. When they are not correct they should be withdrawn.

2945. The reduced price has nothing to do with it. The reduced price would be no justification for the sale of such maps with the Ordnance stamp upon them?—We often cancel large editions of maps, for our own reputation's sake.

2946. And you think the Ordnance Department ought to do the same?—I think so.

Mr. G. H. Johnston.

31 May 1892.

Mr. J. Wyld.

2954. What do you think of that paper as a map paper?—You see this has the objection I quoted, it cracks; that is fatal to a map.

2955. You think it would not be good enough in quality?—I think not.

2956. (Mr. Roby.) That paper is used for an atlas?—It is a fairly good edition, but it is nothing like the quality used by the Government at the present moment.

2957. (Chairman.) You think that would not be a satisfactory paper to use?—If it was put to me to select the paper I should say that is not good enough; considering the price that is paid by the public for the map, it is not sufficiently good. (The Chairman handed to witness a paper left by Mr. Johnston marked "Paper No. 2.") This is a different paper altogether from No. 1. It is worse still.

2958. Would you look at that map of Edinburgh only as a piece of paper?—No. 2 paper beyond doubt takes the impression extremely well. It has a sufficiently good face on it to take a satisfactory impression.

2959. Do you think it would break or crack?—No. 2 does not crack like No. 1. For that purpose it is better, and it is a different class of paper entirely from No. 1.

2960. Would you recommend a change from the existing paper to either No. 1 or No. 2 with a view to cheapening the map?—No, certainly not.

2961. (Mr. Roby.) The evidence we have says that whereas the Ordnance charge 2s. 6d. a sheet, it could be done on that paper for about 3d. or 4d. ?—That may be. I would not give an opinion upon that, as there are very many matters connected with the production of a map, and the way in which it is manufactured. Mr. Johnston, perhaps, would produce a map for a shilling which would cost me 15 pence, or vice versa.

2962. In comparing the Government paper with this paper, the difference of expense is very large?—The expense is enormous, there is no doubt. At the same time I think the Government uses some paper that is by no means perfect. It is, in my humble opinion, a great mistake to employ inferior paper for the purpose of saving expense, because if you employ a paper that cracks or takes the impression badly, or paper that tears quickly and cannot be used either in the open air or in the drawing-room, in that case the public immediately begin to grumble. I think a saving might be effected in the paper, but it is not of such vital importance for the Government to produce a map economically as it is to produce for the public a map as perfect as it can be. I may say, with regard to the selection of paper, that in the trade we keep as little paper in stock as is possible; we only keep what is absolutely necessary, for a good many reasons. In the first place, paper deteriorates unless kept in very large bulk, and then it gets dirty at the edges. Then there is the process of putting it through the guillotines for the purpose of cutting the edges off, and that adds to the expense of production. The next thing is that paper fades in colour even in bulk if it is kept, for any particular length of time.

2963. (Sir A. Geikie.) Do you mean it gets yellow?—It not only gets yellow but it fades; a different tone comes on it. That may arise from some of the chemical matters which are used in the manufacture. We use a great many chemicals. We use chloride of lime and so on; that may have that effect. I know in my own

Mr. J. Wyld.
31 May 1892.

factory my father used to keep a large stock of paper. I do not; I buy it as I want it. I endeavour to buy a sufficient quantity—what I think will be sufficient for a particular period.

2964. Is it your opinion that any serious diminution in the cost of the Ordnance Survey maps could be effected by a change in the quality of the paper?—There is no doubt if you print the map on cheaper paper it might be sold more cheaply.

2965. Is that a change which you would recommend?—No, I do not recommend it. I would rather the public should pay the same price, although they grumble at it, as they do now, so that they may have a good article. A great mistake, I humbly think, is to supply the public with a map of which they have real grounds of complaint. If you give them inferior paper, architects, surveyors, and people of that class who have to use these maps for the purpose of their profession will grumble enormously if they have paper that cracks.

2966. (*Lieut.-Gen. Cooke.*) The difference between good and indifferent paper would not be, I suppose, more than 2d. a sheet?—I could not say; I could not give an opinion upon that without seeing the papers themselves; under their circumstances the Government perhaps might be in a position to buy a very large quantity at a very cheap rate. For instance, if I go to X Y Z, who is a paper merchant, and who has or is likely to have a very large stock, and I buy his whole stock, I get it for cash at a very large reduction, and then I can print the map very much cheaper, and publish it cheaper, and get a larger profit; on the other hand, if he has to manufacture it for me, and to deliver it by a certain time, probably I should not get it so cheaply.

There was one other matter I was going to draw your attention to, if I may, and that is this: Of course under existing circumstances Mr. Stanford is the sole agent. If one of the public comes to my shop for the purpose of buying a sheet, and I have not got that sheet in stock, and the customer selects from the index what he considers to be the sheet that he requires, irrespective of scale, and I send over to Mr. Stanford and get it, and it is found by the customer, as soon as it is brought over from his shop to mine, that it is not the sheet he requires, the sole agent refuses to exchange that sheet or to return the money, the consequence is that is a block to a very great extent to other purchasers of maps for retail besides the sole agent.

2967. (*Chairman.*) Is the system of retailing the maps satisfactory?—It certainly is not satisfactory to the trade, and certainly not to the public. If the proceedings before this Committee are published in the form of a Blue Book, as I presume they will be, I think that is a matter that should be made a matter of evidence before your Committee. I will give you an example of it. Last week, say—I will not pledge myself to the time—over 100 sheets at the end of the week were returned on my hands, for which I paid actual cash, money down.

2968. Is this an actual thing?—This is a fact.

2969. But not in the course of a week?—In the course of one week.

2970. You have had 100 sheets returned?—I say 100 sheets. I do not want to exaggerate. I had 100 sheets returned, which are perfectly useless to me.

2971. (*Mr. Roby.*) How did the mistake arise?—By reason of the stupidity of the British public. A man comes in. He says, "Give me sheet so-and-so." Of course we do not keep so large a stock as we did in days gone by, not being agents. Mr. Stanford is close by. We send over to the agent and buy the sheet, paying absolute cash down for it. The sheet is brought back, and the customer says, "I want the next sheet to it."

2972. Did you have one customer order these sheets?—No; 100.

2973. One hundred stupid people?—I will not say that, but 100 people made mistakes.

2974. (*Chairman.*) Is that in one week, or as the result of a quarter's trading?—One particular week since Christmas, as I can absolutely prove. I have now in stock the 100 sheets that will remain as stock sheets, and may or may not be sold.

2975. That happens every now and then?—Nearly every day.

2976. I want to get it into a concrete case if possible; in one particular week between last Christmas and now

you have had 100 sheets thrown back on your hands, which remain with you because the customers who ordered them by mistake will not take them, and you cannot return them to the agent?—We cannot return them to the agent.

2977. And that occurs more or less daily in every week of the year?—Nearly every day of the year.

2978. (*Mr. Roby.*) Are they all scales mixed?—Oh, yes; you see we sell an enormous number of maps of the Ordnance Survey—next to Mr. Stanford; and, of course, our house having been established for over 200 years, there is a very large clientele who purchase from us because we are the old-established house; they do not go direct to the sole agent. Then there is another matter to which I think I might respectfully draw your attention. I do not know that is a matter of personal grievance. It is this: though I am not an agent, every facility, I humbly think, should be afforded by the Government to the retail sellers of maps in selling them to the public. For instance, as soon as a new index is published, we ought to be supplied at once by the sole agent; on application it certainly ought to be supplied to us and to other well-known purchasers of Ordnance maps; instead of which the sole agent keeps that index perhaps for six weeks or two months, and we know nothing about it unless we send over and ask. The consequence is that the British public is kept waiting. We have amongst our books one for what is called "Requirements."

2979. (*Chairman.*) One of the suggestions which has been made to us is that by printing one index with the different lines for each scale of map in different colours that index might be produced so cheaply that it could be issued gratuitously to the public?—Well, I see no objection to that.

2980. But still you prefer the three indices?—Certainly.

2981. Although they would be more expensive?—The expense is very trifling.

2982. In any case you would recommend that the indices should be supplied gratuitously?—I do not know gratuitously, but for a minimum cost. You see we pay 1½d.—2d., I suppose the public pay—for every index sheet that comes out.

2983. When you send out catalogues of your trade productions, you send them out gratuitously?—Of course.

2984. And you think the Government should do the same?—Of course. Take, for instance, this sheet of Yorkshire. Say the sole agent, Mr. Stanford, had that a fortnight ago from Southampton. Very good; they will let us have as many copies as we want; but if we did not inquire we should not know that it was out. The very moment that I receive this sheet, the process is this: to every person that we can trace by directory, and so on in the whole of this area, a lithographic form is sent saying that they can be supplied with this particular sheet; and that is done at my own expense. Of course, as a matter of trade, I combine my own catalogue and list of publications in the wrapper, but on the outside of it there is put "Index of Ordnance Survey." That is to draw the attention of the clergyman, the overseer, or whomsoever it may be to whom it is sent. For instance, of this sheet we might send out 500. Supposing that came in this morning at 11 o'clock, it would be my manager's business to see that everyone was directed and sent off by the evening's post, so that those to whom it is directed might have it by the morning's post. I dare say Mr. Stanford adopts a similar plan; but then, of course, he has the advantage; he has had a fortnight before it is issued to the other retail dealers in London, and he has the opportunity of selling it to the public; he may or may not.

2985. (*Mr. Roby.*) As I understand, neither the agent nor the Department send you the indices except upon application?—Except upon application.

2986. And you see no reason why either the Department or the agent should not send you indices as soon as they come out?—I prefer them to be sent from the Department rather than from the agent. I would humbly suggest that to certain of the trade (of course discretion must be exercised) they should be sent free, or one copy at all events.

2987. (*Chairman.*) You recommend that the Ordnance Department should have a list of the principal map-dealers, and, although Stanford is their agent, they should issue from Southampton to such persons their

indices?—Yes; of course the object of a retail shop is to sell as many things as they possibly can. Of course it is to my advantage to sell as many Ordnance maps as I can.

2988. Do the terms upon which you sell Ordnance maps answer your purpose?—Certainly not in the Ordnance department.

2989. I understand that Southampton does publish every week a list of their new maps. If that were sent to you weekly, it would answer your purpose?—It would be the greatest boon to the public that could be, because the very moment we obtain it we send round to all our clientele.

2990. Is there any other point?—Yes, there ought to be some process by which either the sole agent or the Department at Southampton should purchase back old or obsolete sheets. In the course of five years there is an accumulation of sheets which get out of date, those once purchased by me have to be kept by me. I never under any circumstances, if I can possibly avoid it, sell an old map when a new edition has been issued by the Government, and that is an absolute loss to me.

2991. A method should be adopted of buying back obsolete editions?—Yes.

2992. You would not ask the Southampton people to buy back a sheet of a modern edition in your possession?—No.

2993. Only obsolete ones?—There is no object in buying modern editions back from me, unless I want to get rid of the business.

2994. You do not profess to keep a large stock of maps?—I do not profess to do so, although as a fact I have a large number of sheets.

2995. You had 100 sheets returned on your hands in one week, those did not belong to obsolete editions?—No.

2996. But they were stock which you got for particular customers which were not wanted, and you suggest that the Department should buy those back?—No, not buy them back, but exchange them for other sheets that are required.

2997. (*Mr. Roby.*) How does that compare with the treatment you would have from another map publisher. Should you in that case be able to send back sheets two or three years old?—Certainly, if Mr. Keith Johnston published another edition of his map of Scotland, and I had 500 copies of his already paid for, and he communicated to me that he had issued a new

The witness withdrew.

Sir ARCHIBALD GEIKIE, a member of the Committee, examined.

3007. (*Chairman.*) What have you to tell us?—I think perhaps it would be for the convenience of the Committee if I made a statement on which the Committee can put any question to me. The evidence that I propose to give arises from the relation between the Geological Survey and the Ordnance Survey. The Geological Survey work is based on the maps of the Ordnance Survey, and I suppose that these maps have never been put to a severer test than they have been by the detailed work of the Geological Survey. They have been examined from the seashore to the tops of the mountains in every conceivable kind of district from one end of the country to the other, so that our experience of them—and I speak not only for myself but for all my colleagues in the service—is a more extensive and detailed experience than has been given by any other body of men. My own experience goes back over some 37 years. During the earlier part of the time I was engaged in personal survey and mapped many hundreds of square miles with my own hand. Afterwards I became Director of the Geological Survey of Scotland, and continued to survey, besides personally superintending the work that was going on in that part of the United Kingdom. For the last 11 years I have had charge of the whole of the Geological Surveys of England, Scotland, and Ireland, and have had constant experience of the work of the Survey in all the three kingdoms. The evidence I propose to lay before you gives my own experience and that of my colleagues. The Geological Survey mapping is made upon the 6-inch maps of the Ordnance Survey. Before these maps were available for our purpose the surveys were conducted on the 1-inch scale, but as

edition, I would send him back the old edition and he would send me copies of the new, and he would cancel the old.

2998. Is that the same with regard to books?—I do not know anything about books. I sell nothing but Wyld's maps and the Ordnance Survey.

2999. And I think guides?—Guides are nothing. I sell Baedeker's.

3000. (*Chairman.*) Is there any other head you would wish to mention?—On the question of exchange, I think the Government should sell only new editions, and that no old editions should be supplied to the public at large.

3001. (*Mr. Roby.*) In fact, should be cancelled?—Should be cancelled.

3002. (*Chairman.*) Do you think that the Government do send out old editions?—Oh, yes, occasionally. When they have run out of the last edition they will send you anything; they comply with the order. Perhaps it is our fault very often, because we send over to Mr. Stanford and say we must have a copy of so-and-so.

3003. You take Mr. Stanford as the Government for this purpose?—Of course, I am not allowed to deal with any other person under the terms of the arrangement. It was different when Mr. James Wyld was one of the agents. Of course, we were under a very different régime; there was an exchange of maps. Every courtesy was shown, and if by accident any old sheet was given to us it was changed in a moment.

3004. Do you think the old stock is constantly issued?—That is rather too strong an expression; but old stock is occasionally issued when new sheets should be supplied.

3005. (*Mr. Roby.*) You think that is mainly due to the fact of the want being imperative for some map or another?—No, I will not say that. I think the cause of that is this, that the Government instead of withdrawing all the old editions retain the old editions or allow the sole agent to have old editions in his possession which he ought not to have. The moment a new edition is issued the old editions ought to be cancelled and new ones supplied, and then there would be nothing to grumble at.

3006. (*Mr. Brickdale.*) Was that formerly the rule?—Invariably under the old régime, if there was an old map. If we complained of their sending us an old map or sending an old edition they would say, "Please send them back," and gave us a new edition at once.

soon as 6-inch maps were procurable the work was carried on on that scale and has been ever since. Except in the portions of England where the 6-inch maps did not exist, and those parts of Scotland not yet mapped by us, we have now detailed geological surveys of the whole of the three kingdoms on the 6-inch scale. We have only published the 6-inch maps for mineral districts, and latterly we have given up doing even that, for the number of maps sold seemed hardly sufficient to justify the expense of engraving and publication; but the survey continues to be carried on upon the 6-inch maps, and as the maps remain in the office, we supply to any member of the public who wants it a manuscript copy of any 6-inch map in which he happens to be interested. The cost is merely that of manual transcription. The general excellence of the Ordnance Survey maps is a constant subject of remark. The special value of the 6-inch maps to my staff is that they serve the purpose both of maps and note-books. We can get almost all our detail, all the important detail for geological purposes entered upon the original working 6-inch maps. Another advantage in the early contoured 6-inch maps lay in the fact that the contour lines were so close together that we could run sections across the country without using chain and theodolite. Formerly when we had only the 1-inch map to go by the horizontal sections on the vertical and horizontal scale of 6 inches to the mile, had all to be measured across country, but as soon as we had these 6-inch Ordnance maps we could plot the sections directly from them. It would be quite impossible to carry on a detailed geological survey as we carry it on on any smaller scale than the 6-inch map. We have tried in recent

Mr. J. Wyld.

31 May 1892.

Sir A. Geikie.

Sir A. Geikie.

31 May 1892.

years to see if we could not economise time and labour by using the 1-inch map for the field survey; but after trying that for a time in different varieties of country, we were compelled to abandon it and go back to the 6-inch maps as effecting really on the whole a saving both of time and labour.

3008. You have published a 1-inch geological map of all England?—Yes.

3009. But that, you think, is not satisfactory?—Oh, yes; the general map of the country is published on the 1-inch scale. I was coming to that immediately.

3010. (Mr. Roby.) Six-inch maps of the whole of Ireland exist in manuscript in the office in Dublin, geologically coloured?—Yes, and the whole of Scotland, so far as it has been surveyed, has been surveyed on the 6-inch scale, and the original field maps are in the office of the Geological Survey in Edinburgh.

3011. As a whole?—The whole of Scotland is not yet surveyed geologically; the survey is going on there now. I draw a distinction between the Ordnance published maps and our own published maps.

3012. How much of Scotland has been done geologically?—Well, I could give it you exactly; more than half.

3013. And of England?—The whole of England has been surveyed, but not on the 6-inch scale. When these 6-inch maps began to be published we used them, but at that time we had already published on the 1-inch scale the whole of the southern half of England. We are now going over that area and re-surveying it, and it will be published on the new Ordnance 1-inch maps; but we shall have the 6-inch maps in manuscript for anyone who wishes to have a manuscript copy as I have already said. We reduce the maps from the 6-inch scale to the 1-inch, and they are published for the whole country on the 1-inch scale.

3014. For England, Scotland, and Ireland?—For England, Scotland, and Ireland. Every Ordnance 1-inch sheet is or will be published also as a Geological Survey map with geological colouring.

3015. How is the colouring done in that case?—Coloured by hand.

3016. Every copy?—Every copy is coloured by hand.

3017. Have you tried the process of printing in colours?—Experiments were made some years ago at Southampton, but the results were not satisfactory.

3018. Owing to defects of registration?—The defects of registration were so great that it was found to be impossible to use that mode of reproduction. That is some time ago, and it is possible the Southampton office may now be in possession of some better methods of working than formerly.

3019. (Chairman.) I suppose the sale of geological maps is not very large?—Some sell fairly well, but on the whole it is not very large. I am not sure whether they would pay to produce in chromolithography. We keep a small stock, and we keep them up to date.

3020. (Mr. Roby.) What is the cost of hand-colouring the 1-inch map?—It depends on the size of the sheet. In Scotland the price of the maps varies from 4s. to 6s.

3021. Per quarter-sheet or per sheet?—Per sheet. There are no quarter-sheets in Scotland. In England the prices are usually for full quarter-sheets 3s. and for full sheets 8s. 6d., the price depending upon the size of the sheets and the amount of work on them. In Ireland the sheets are generally 3s. Some sheets involve much time and labour in colouring, while others are comparatively simple.

3022. Those are the hilly districts, I believe?—They are not specially connected with the hills. It is where geological formations are crowded together. In such places there are a great many more colours than in others.

3023. (Chairman.) Where is the colouring done—in Scotland?—No, it is done by a firm here, and entirely, I believe by women. I have spoken of the great excellence of the Ordnance maps. We have tested them everywhere all over the three kingdoms, and we can speak with some confidence as to the extreme accuracy and beauty of the maps. I can hardly conceive of a survey more technically perfect than ours. Of course, we have found mistakes in the maps, but they are comparatively few. I think I could almost reckon on the fingers of one hand all the mistakes I have personally

come across after many years of work in the field. There are some defects certainly in the 6-inch maps which we might wish to see remedied. I think it is a great pity the Department has abandoned the contouring of the maps in the Highlands, except on the low grounds. In the higher parts of the country to which I am referring there are no contours in a great part of the country for square mile after square mile.

3024. (Lieut.-Gen. Cooke.) Above 1,000 feet?—There is no contouring above 1,000 feet. The consequence is that in the absence of geographical features, geological surveying is extremely difficult. My men have adopted the course of taking the contours from the 1-inch map and roughly transferring them to the 6-inch map. Although that is, of course, a very rude representation of the configuration of the country, it is better than nothing, and gives some indication of the general form of the ground. I would strongly recommend the resumption of the contouring of these maps.

3025. That is to say, putting 250 feet contours after 1,000 feet?—Yes, I should begin the contours at every 25 feet as they were in the early 6-inch map of the south of Scotland up to a height, say, of 250 feet; then every 50 feet up to 500 feet, every 100 feet between 500 feet and 1,000 feet, and every 250 feet above that.

3026. (Mr. Roby.) Instrumental contours?—I should not care so long as a certain number were instrumental. The others might be done in the simpler way we have already considered.

3027. For your purpose that would be sufficient?—For my purpose that would be quite sufficient. I wish to say that contours are permanent. While the topographical features, such as pits, hedges, ditches, and so on, are constantly changing, the contours put on the 6-inch map are a practically unchangeable topographical detail of the country. I think also it would improve the 6-inch maps if greater attention were paid to certain forms of topographical detail which used to be shown with admirable beauty and accuracy in the earlier maps, such, for instance, as cliffs and reefs. I know maps of some parts of the country in which the shore reefs are so admirably engraved that even before going over them one can see what the geological structure is, how the outcrop of strata runs, and where it is traversed by dykes and dislocations. I do not know that such mapping would take a longer time than the method adopted now, and if there was no great difference in respect of the amount of time and labour expended it would certainly be very desirable for geological purposes that the earlier and more careful method of representation should be resumed.

3028. (Lieut.-Gen. Cooke.) That applies to the sea-coast almost entirely?—Yes.

3029. You find that in Scotland, not in Devonshire and Cornwall?—We have not any 6-inch maps of Devonshire and Cornwall yet; I have not seen them.

3030. (Chairman.) Your remark applies to the Scotch coasts?—Yes.

3031. Where have you found them deficient in England?—We have found them deficient in the more recently published 6-inch maps both in England and in Scotland.

3032. (Mr. Roby.) The Scotch maps on the 6-inch scale?—Yes.

3033. Could you mention any other part of the country?—Yes, the best pieces of engraving of the 6-inch map in Scotland are the south-western counties—Wigton, Kircudbright, and Ayrshire.

3034. All the counties of the Western Highlands?—They are less well done in the recent 6-inch maps. Then another defect in the 6-inch maps, especially of the recent issues, may be noticed in the names of places. There is a good deal to be desired in the way of more accuracy in the engraving of topographical names. Sometimes a phonetic spelling has been adopted. I am talking more particularly of the south of Scotland and of the Highlands, where there is a Celtic element in the nomenclature. Sometimes phonetic spelling has been adopted; sometimes the surveyors have taken the old Celtic spelling as near as they could get it. I think there is a good deal to be said for both of those ways of representation, and it would be sometimes desirable that both should be adopted. Sometimes, as we have already heard in the evidence which has been given to us, the local pronunciation of a name is entirely different from the Celtic spelling, and if you spell the name as it is locally pronounced you can draw no con-

clusion whatever as to the probable meaning, and therefore history, of the word. All these old Celtic topographic names have some local meaning. Very many of them were suggested by local conditions of the country which have disappeared; therefore, they are of very high interest to inhabitants of the country, and I think it is desirable to retain, as far as we can, our hold on the history of these names, connected as they are with the history of the localities to which they have been affixed.

3035. Do you think it desirable to add on the map also the more modern pronunciation?—I should give, as nearly as it can be got, the actual Celtic spelling of the word, and where that spelling differs much from the pronunciation, I should give the local pronunciation in parentheses afterwards.

3036. (*Chairman.*) You mean phonetic spelling. (*Mr. Roby.*) A spelling to represent the pronunciation?—I should be inclined to spell the words as they are locally pronounced, wherever there is a marked variation from the grammatical spelling.

3037. (*Chairman.*) That would apply to large parts of England and would lead to very odd results. There are places well known as spelt of which the local pronunciation is extremely different from the spelling?—I think you will find that Gaelic names furnish extreme cases, and when you see some Gaelic names printed accurately, I do not think any Saxon would be able to make out what the proper pronunciation of these words is. If you pronounce the name as it is spelt the people of the country will not understand what you say, and the only thing to be done, where the spelling and the pronunciation differ so widely from each other, is to give the actual pronunciation for the benefit of the Sassenach.

3038. Perhaps you limit that to Scotland?—Chiefly, but it applies to parts of Ireland as well. Then some of the local topography is slightly erroneous. For instance, wells and springs, one being an artificial and the other a natural outflow of water, are constantly confounded. Again, information is often given which is erroneous and which might with advantage be omitted. For instance, the term gravel-pit is constantly applied on the Ordnance maps to a place from which no gravel was ever taken, but from which perhaps stone has been quarried; limestone quarry may be mentioned on the map, which turns out to be sandstone; and a mine with the word "lead" after it in parentheses may turn out to be an ironstone mine. Then the "entrenchments" put across the map may turn out to be no entrenchments at all, but simply old mine workings. Mistakes of that kind are not very serious, but in pointing out defects of the Ordnance Survey I am really giving the most serious I can find. I am speaking now entirely of the 6-inch maps; of course some of these errors have been transferred from the 6-inch map to the 1-inch. In some parts of the country those of which the 6-inch maps have been most recently produced (I refer to the Highland districts) a number of lakes have been omitted, and the islands in some of the lakes have been inserted somewhat out of place. I dare say that in many cases the surveyors who put them on the maps never supposed that any cultivated being would ever go near them, and these areas have been surveyed probably with a little less accuracy than is usual in the 6-inch map of more populous areas.

3039. If you could mention these places it would be very desirable?—I can give you a list of them. Then with regard to the 1-inch map, the earlier sheets of the hill-shaded maps—those of North Wales for instance—were admirably suited for geological purposes. The general topography was clearly marked upon them, and yet it was done so delicately, and lightly, that the geological colours were not interfered with, and the hill-shaded maps were just as good for geological purposes as maps could well be. There is one passage which perhaps I may be allowed to read, written by a man who knew North Wales well, the late Sir Warrington Smyth. In a note of his in the first volume of the "Memoirs of the Geological Survey," published as far back as 1848, he said: "It is scarcely possible to obtain a more vivid portraiture of the 'superficial features of this highly contorted country' (that is North Wales) than that which is presented 'by the beautiful and truthful shading of the Ordnance map.'" That is quite our own experience, and the more recently engraved 1-inch maps, particularly those of the north of England and the south of Scotland, are certainly most admirable pieces of hill-shading. As diagrams to be hung on walls and looked at from

a distance nothing could surpass them. They give at a glance the general configuration of the country. But for geological purposes a number of the sheets are too black, the shading is too intense, and the maps, therefore, are less well adapted for geological purposes than the old North Wales maps were. So much is this the case, that as we have come north in our Geological Survey work into the Highlands, we have found the hill-shading to be so black, that we have had to abandon the use of hill-shaded maps entirely for geological purposes, and our 1-inch maps are now prepared upon the contoured maps. The contoured 1-inch map is excellent for geological purposes; in many respects it is superior to the hill-shaded map, because the geological colours are not interfered with at all by the hill-shading, and the contours enable us to judge of the relative elevations of the various formations. I would suggest as one or two improvements of these contoured maps, that in the first place there should be closer contours, say every 50 feet up to 500 feet, and every 100 feet from that to 1,000 feet, and above 1,000 feet say every 250 feet. I think with these closer contours the value of the map would be greatly improved. Of course it is below 500 feet that the largest area of inhabited land lies, and where it is so important to have the configuration of the country that is delineated on the map, but there are large tracts of ground where the minor features are not indicated at all. Then, in the second place, I think roads and railways are represented by unnecessarily thick lines. The engraving of these is a little heavy, and a distinct advantage to the map would be gained if they could be made thinner and lighter. There is a difficulty also in distinguishing between mere footpaths and roads with hedges. That has been obviated by the introduction of a single dotted line to indicate the footpath on more recent maps. Then as regards the map of 4 miles to the inch, a good deal has been said before the Committee. I was not present when Sir Charles Wilson gave his evidence, but I understand he told the Committee that he had been led to publish his map from the fact of its having been completed to be used for Geological Survey purposes. This map, on the scale of 4 miles to an inch, has been put certainly to a very severe test by my colleagues of the Geological Survey, the geological features having been reduced upon it from our 1-inch sheets. Of course this map is a reduction of the old 1-inch sheets, and it was on these that our geological work was published, so that we are not comparing that map with what the reduction from the new 6-inch maps would be. But looking at it as simply a reduction of the old 1-inch map, I think it is exceedingly well done. The railways of this map have been brought up to date; the general topography of the map also has been in many cases considerably improved; possibly a little more might have been done in that respect. Some of the towns which are of importance are shown as mere hamlets and in some cases have been omitted altogether. One or two minor errors in topography have been likewise introduced, besides those to which Mr. Crook called attention. I think a little more labour spent in remedying these defects would be well bestowed, and would make the map of very much greater value. Perhaps more heights also might be inserted, and that would still further increase the practical usefulness of the map. But as a general geological map of the county, I do not desire anything better. I do not care to have the topography extremely detailed in a geological map; it is enough if we produce a map which will present a fairly accurate view of the general geological structure of the country, and I think that can be well done on this 4-miles-to-an-inch map. The inaccuracies in the engraving of the map can for the most part be easily remedied. Of course, the omission of towns is an omission which is traceable to the 1-inch map, but there are few errors of reduction.

3040. With a little attention that might easily be brought up to date?—I think so. You see that the errors are reduced very much when the map is reduced to 4 miles to the inch from the 1-inch scale. The 25-inch scale map we scarcely ever use; except sometimes where there is a piece of great geological detail which can hardly be adequately represented on the 6-inch map. We then make use of the 25-inch map for the purpose of reducing it to the 6-inch scale. With regard to indices, the 25-inch index hardly affects us at all, but the 6-inch indices we have found quite satisfactory. I do not think I have heard any complaint from my staff (or hardly any complaints) made of the usefulness of the index map of

Sir A. Geikie.

31 May 1892.

- Sir A. Geikie.* the 6-inch map for all practical purposes, and as regards the 1-inch index—such an index, for example, as is published in the Blue Book—I have never found any of my officers of the Survey make any complaint as to a difficulty in identifying any particular sheet or quarter-sheet which they wished to be supplied with. As a mere index, it is quite sufficient, I think, for its purpose, although if you were to judge of it as an accurate piece of topographic reduction, of course you could find errors in it; but as a mere index it is quite sufficient for its purpose. These are the main points which I wished to lay before the Committee.
3041. (*Mr. Primrose.*) In your geological maps do you simply take the geology of the surface or do you give sections?—We give sections showing on the scale of 6 inches to a mile the structure underground.
3042. But if you buy a geological map which is coloured as if there were counties and parishes, that merely shows you the geology of the surface?—It shows you the geological formation at the surface.
3043. If you know anything about it, you know what is below the surface?—Quite so.
- 3044-7. (*Mr. Roby.*) It is not, of course, the actual surface?—It is not the surface soil. We publish two kinds of maps. We have what is called the Drift survey, that is where all the superficial deposits are represented and the solid rocks underneath are only indicated where they come to the surface of the country, each being shown by the particular tint which denotes that special deposit. Then in the second class of maps, which we speak of as those showing the Solid Geology, the mere drift, gravel, or sand, which is spread over the surface of the country is disregarded, and we show the actual solid geological sub-stratum—the Chalk, the London Clay, or whatever it may be that lies below.
3048. (*Chairman.*) Your 1-inch geological map is the old 1-inch map with certain boundary lines for the out-crop of the strata printed on it and then filled in by hand?—Quite so. The lines are engraved and the colours are filled in by hand.
3049. You are acquainted with the maps of foreign countries?—Yes.
3050. Do you think we are ahead of them?—In geological maps I think we are.
3051. And our Ordnance map is as good as theirs?—I think it is better. There is no foreign Geological Survey where the work is carried on and published on maps of such a large scale as ours.
3052. (*Lieut.-Gen. Cooke.*) And there is no foreign cadastral survey?—None to be compared with ours.
- Adjourned to Wednesday, June 1, at 11.30 o'clock.

Board of Agriculture, 3, St. James's Square, S.W.

NINTH DAY.

Wednesday, 1st June 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Lieut.-General ANTHONY CHARLES COOKE, C.B.,
R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE, and
Major DUNCAN A. JOHNSTON, R.E., *Secretary*.

Mr. ROBERT MORHAM called and examined.

*Mr. R.
Morham.*

3053. (*Chairman.*) You are a civil engineer?—City Architect and Superintendent of Works in Edinburgh.
3054. Have you long occupied that post?—Yes, since 1872.
3055. And you are well acquainted of course with the Edinburgh town map?—Yes.
3056. That was not originally paid for by the city of Edinburgh?—No.
3057. It was made by the Ordnance Survey Department?—Just so.
3058. Do you know in what year?—The map is dated 1853.
3059. In 1877 the city paid a considerable amount of money to have it revised?—Yes, the city advanced the money and they were repaid in proportions by various bodies who were interested in the matter.
3060. But not by the Ordnance Survey Department?—No.
3061. Since 1877 nothing has been done with it?—No.
3062. Have you yourself corrected that map from time to time?—When I have had occasion to do so, not the whole map, only particular parts; but one of our officials, the borough engineer, has a regular system of correcting it, and his maps are available for anyone who wishes to see them.
3063. I suppose the map is a better map than you would have been likely to get by private enterprise?—I have no doubt about that.
3064. Mr. Keith Johnston was here yesterday, and he told us that he produced annually a corrected map on a smaller scale?—I believe that is so.
3065. And that he corrected the map by the help of the drawings supplied to him by the city authorities?—I am not aware; I have no reason to doubt that it is so.
3066. You have not supplied those drawings?—No.
3067. It is no part of your duty to keep the map corrected?—No.
3068. Do all plans of new buildings under the Edinburgh byelaws come under your inspection?—Yes.
3069. And not under that of the city engineer?—They come under both.
3070. Who takes charge of those, you or the city engineer?—The Clerk of the Dean of Guild Court takes charge of them ultimately.
3071. Who sees that they are properly carried out?—An inspector under the borough engineer.
3072. You approve the elevations I suppose?—What I have to see to on behalf of the town is that there is no encroachment on the town rights, or on the public streets, or on any property belonging to the town.
3073. What is the borough engineer's duty?—His duty is to see that there is proper drainage and sanitary appliances.
3074. Then you both approve the plans?—Yes.
3075. Was your original plan a skeleton plan, or was it hatched?—A skeleton plan.

3076. A stippled plan?—No, I think not.

3077. The old map of Edinburgh was a skeleton map?—Yes.

3078. And the map of 1877 had the houses shown by stippling, which is a finer way than hatching of indicating blocks of buildings?—Yes.

3079. The town plans now being made are always in skeleton, and in order to indicate houses distinctly they have to be coloured; do you know that?—I am not aware.

3080. I put into your hands a town plan. That plan may be bought as a skeleton for, I think, half-a-crown uncoloured. I suppose you would say that that is an unsatisfactory representation to the eye in its present condition?—I should say so.

3081. When it is coloured it costs 8s.; you would say that that was making it a very expensive plan?—Yes, a very expensive plan.

3082. It is now proposed, or it is now suggested, that instead of publishing it as a skeleton map, it should be published like that in hatched form. Is that satisfactory?—While a hatched plan is preferable to a skeleton plan, stippling, especially for the larger scale, seems preferable to either, for the reason that hatching, such as that on the specimens to that scale shown, would have the lines falling in some cases parallel with those of the buildings, producing uncertainty. With stippling any such confusion or doubt is avoided.

3083. And then you would not ask to have a coloured edition?—No, I think not.

3084. We have been discussing the question of the constant revision of these plans; would you say a revision once in 15 years was sufficient for town plans?—I think not. I think they should be revised more frequently.

3085. Would once in five years be sufficient?—I think that would be reasonable.

3086. If practicable you would like them revised every year?—Oh, yes; but I think that would be too much to expect.

3087. If the town surveyors, either the city architect, or the city engineer, were placed under a legal obligation to supply to the Ordnance Survey Department on the scale of the city map tracings of drawings that come into their hands under city byelaws, do you think the information would be sufficiently accurate to enable the Ordnance Survey constantly to revise the city plan?—That is very much what I should have proposed as a means of keeping the Ordnance Survey people informed as to what has been done.

3088. Do you think it would be sufficiently accurate for the Ordnance Survey Department to put it on their plan without examination?—I should scarcely say so. I think it would be rather the means of drawing their attention to the fact that such alteration had been made, and they could check it for themselves.

3089. If they sent an examiner every year for two or three days that would enable them to make adequate examination?—I should think so, ordinarily.

3090. And the map so corrected might be supplied as a drawing in MS. to applicants by the Ordnance Survey Department at any time, and once in five years, perhaps, be issued as a publication?—Yes; I think that would do very well. I should like to say that I defer at once to Mr. Johnston in the matter of what is practicable in engraving or preparing these published plans, to which I do not pretend to any knowledge; but it appears to me that what I have already said would meet the case.

3091. And would be quite practicable?—I think so.

3092. (Chairman.) Your Edinburgh map is a 5-foot map, and is an engraved map?—Yes.

3093. Do you think it necessary in accordance with the general practice now adopted outside London, that Edinburgh should be supplied with a 10-foot map?—There are decided advantages in a larger scale map, no doubt, and if it were on a style of equal fineness and accuracy to the smaller map, I should say that on the whole we had better have it.

3094. Considering that the smaller map is an engraved map, and that the 10-foot map is a zincograph map, and therefore coarser, you are satisfied with your

5-foot map?—Yes, in respect that it embraces in one given size of sheet a much larger extent of ground than you can have on the same size of sheet with a larger scale, and its fineness compensates for its being on a smaller scale—the accuracy and fineness with which it is executed.

3095. If they will continue to give you a 5-foot map revised up to date, and equally well drawn with your present one you would prefer that to a new map coarser in style on a 10-foot scale?—That is my own feeling, and I believe it to be the view pretty generally held.

3096. Do you think the borough engineer would agree with you?—Yes, I have spoken to him about it; he inclines to the same opinion.

3097. If the 10-foot map could be produced in an equally good style you would prefer that?—Yes, I should say so.

3098. The reason why you are satisfied with the 5-foot map is, that owing to the delicacy of the lines due to its being engraved, you are able to measure as accurately on that map as you would on the 10-foot map that is photo-zincographed, and consequently coarser in style?—The reason is rather that it comprehends so much more in one sheet, and any advantage there is in the larger scale is compensated in the case of the smaller scale by the fineness of the work. This preference is owing to the larger area actually embraced in a given map.

3099. And not due to the fineness of the work?—The two together. We lay great stress on the more convenient size.

3100. Do your town maps show the levels throughout the city?—A great many, but we should like to have a great many more. There are some districts where they are not shown to the extent they might be with advantage.

3101. How many levels have you along Princes Street?—I should think there are about 20 in three-quarters of a mile.

3102. Along Princes Street you think the levels are sufficient in number?—Yes, but there are districts elsewhere, though I am not now prepared to specify such, in which further information as to levels is much wanted.

3103. The levels are not sufficiently shown over parts of the area of Edinburgh, and you would be glad to have a good many more?—Yes.

3104. Is the deficiency in the newly built parts?—Chiefly, but not solely; even in some of the old parts there is a paucity of levels. I do not know why.

3105. (Mr. Mather.) Are the levels sufficient to show the contour of Castle Hill across the valley to Waverley Station, and away up to the other side of the valley. Could you from the levels given draw the contour of that valley north and south?—This is one of the cases where there is insufficient detail.

3106. There is a street running north and south up Castle Hill by the Waverley Station and up the other side. Can you from the levels of that street show the contour?—Where there is a street you can, but not across the valley.

3107. (Chairman.) With regard to the detail of this map, trees, footpaths, and gardens, is there over much detail?—No, I think not. I think it is very perfect.

3108. You would not alter this map in style?—I think that in private gardens details of paths, trees, &c. might be omitted without disadvantage.

3109. Does your 5-foot map embrace much area beyond the built-over part of Edinburgh?—Yes, a very considerable portion.

3110. The area of your map includes all within the municipal boundary?—The existing map, yes.

3111. And that comprises all the portions of Edinburgh which are now being built over?—Yes.

3112. Have you any knowledge of the general maps of Scotland?—No. I have no knowledge of them.

3113. You do not wish to give us any evidence on that point?—I have no special knowledge.

3114. (Lieut.-Gen. Cooke.) No knowledge of the 6-inch?—Only as regards Edinburgh.

Mr. R.
Morham.

1 June 1892.

See Wilson,
p. 222.

The witness withdrew.

Mr. A.
Murray.

1 June 1892.

MR. ANDREW MURRAY called and examined.

3115. (*Chairman.*) You are the city engineer of the city of London?—No, I am the city surveyor to the Corporation of London.

3116. Have you been in the habit of using the large scale Ordnance maps?—Yes, very much; the 5-foot scale.

3117. Is it accurate as a map?—Yes, I do not think I have ever found a mistake in it in our department. I have used it very largely, chiefly for estate purposes.

3118. When was it surveyed?—In 1872 it was published.

3119. It has not been revised since?—Not to my knowledge; I do not know. I think the edition we have was published in 1872.

3120. Do you in your office correct the maps for your own use?—No. We have used them chiefly for laying down our estates—to give a general notion of the properties, beyond which we have detailed plans to larger scales. We have found them very useful in dealing with re-letting and laying out before a committee as to how we would deal with blocks, and we found the Ordnance very much more useful for that purpose than our office working plans.

3121. What scale do you use?—22 feet to 1-inch.

3122. (*Mr. Mather.*) That you make yourself?—That we make from our own surveys, yes.

3123. (*Chairman.*) London is surveyed on a 5-foot scale instead of on a 10-foot scale as all other towns are. Do you know under what circumstances London came to be satisfied with a 5-foot scale instead of a 10-foot scale?—I do not know at all.

3124. The 10-foot maps are all, I believe, zincographs?—Yes.

3125. Is the work on the 5-foot map fine or coarse?—Fine.

3126. Can you measure accurately on it?—Yes.

3127. Do you think it is large enough for your purpose, or do you wish for a 10-foot survey?—For my purpose it is large enough. There is a larger survey, is there not?

3128. (*Mr. Mather.*) Not of London?—Croydon, I think, is the nearest town on the larger scale.

3129. (*Chairman.*) Do all the plans for building operations in London come before you?—No; they go to the County Council.

3130. (*Mr. Roby.*) Not even plans for building in the city?—No; they all go to the County Council.

3131. (*Chairman.*) Before the County Council for London was created, did everything of that sort go to the Metropolitan Board of Works?—Yes.

3132. Have you ever had any experience of laying out building lines except for your private property?—Yes, I have. At one time we used to have a very large amount of work in laying down lines of improvement for the city, and when I was younger in the office I had to work out a great many of these schemes, and it was the 5-foot Ordnance that we used. In those days we had only the skeleton 5-foot; now it is brought out more in detail.

3133. What control does the city surveyor exercise over buildings in the city?—None whatever, unless the buildings are the property of the Corporation.

3134. So you only use the map for the private property of the city?—Yes; there is a body called the Commissioners of Sewers who have control over the streets and all minor improvements, but at one time we had a great deal to do in the way of improving the city; in fact, the Holborn Valley improvement was conducted throughout by the Corporation, and the widening and improving of Cannon Street and of the Farringdon Road. With a great many of these improvements I had in my younger days a great deal to do, but more recently, when the Tower Bridge was first being thought of, under Sir Horace Jones I had a great deal to do with scheming out the approaches to the bridge and for that purpose I used the 5-foot scale, which answered our purpose admirably.

3135. I suppose in the city very few changes of the lines of frontage take place now?—A great many, and the maps really want bringing up to date. Very many changes have occurred which are not on the Ordnance map; for instance, Eastcheap and Tower Street have

been completely altered within the last fifteen years. Then, again, the whole of the northern side of the city by Smithfield is completely transformed.

3136. (*Mr. Mather.*) And Clerkenwell, I suppose?—Yes.

3137. (*Chairman.*) Do you think it would be practicable for the engineers or surveyors, before whom all the plans come under the byelaws of their respective corporations, to send to the Ordnance Survey at Southampton copies of the approved plans drawn on the scale of their city plan, whatever it may be, and that the Ordnance Survey should then keep the map corrected every year?—I do not think there could be any difficulty, speaking for my own body. I have no doubt that on application by the Ordnance Survey, they would authorise me to forward plans to Southampton from time to time as we make alterations in any of the estates or public buildings of which we have control, and I would suggest that they should be done on the 5-foot Ordnance, and of course the Ordnance surveyors would test and correct these plans.

3138. You have no official knowledge of any alteration in the city streets except such as occur on the property of the City Corporation?—That is true.

3139. With regard to the quality of the maps, is that 5-foot map a skeleton map on which the buildings can, if necessary, be coloured, or is it a hatched map?—No; nearly all those, I think, show the details of the buildings, but without colouring or hatching.

3140. That is to say they are skeletons?—What you would term skeletons, although I would rather use that word for the old-fashioned map which came out many years ago. The 5-foot map is stippled.

3141. That is what I term a skeleton?—Before the 5-foot map was brought out stippled like this a set of plans was published simply in outline, and not showing the blocks, but in those days we found even those very useful.

3142. (*Mr. Brickdale.*) You found them very useful to fill in for estate purposes?—These are sufficient for my purpose; giving the general block of the property.

3143. (*Chairman.*) This map, I think, is half-a-crown?—Yes.

3144. But when it is coloured it comes very much more expensive?—Yes.

3145. Do you think it would be desirable instead of colouring the map at all, to publish it only in one form, namely, with the buildings hatched like that?—I would not have it coloured; for my purpose it would be better not. I do not know that I even care for the hatching.

3146. You prefer a skeleton map to having it hatched?—Yes, because then I can do what I please with it.

3147. You have it like this (in skeleton), it is necessary for a great many persons to have it coloured, which makes it expensive, whereas if you have it like this (hatched) it is about the same price, but only one edition can be issued. Is this hatched edition inconvenient for you to work upon?—It would be for my purpose.

3148. (*Mr. Mather.*) If it was issued with a lighter hatching than that?—If you must do it, I should say, do not have it quite so dark.

3149. (*Chairman.*) If the hatching was done lighter you would not object to having only one edition?—No; I should not, because even now, for my own use, I make a distinction, in colour, between open spaces and buildings.

3150. Let me draw your attention to that (pointing on the hatched plan). Would you consider that was a solid building?—No.

3151. You would not be deceived?—No; I should not be deceived by that.

3152. It might be a brick building over an archway, or it might be a skylight?—I should read that to be a building over an archway.

3153. (*Mr. Mather.*) The skylights are shown differently on the Ordnance maps?—Yes; they are differently indicated. There is a good deal of detail which, I think, might be saved as not generally of very much public service. I do not think, for instance, there is much object gained in showing lamp-posts. They are liable to be moved, so that if you do not publish an edition for 10 years the chances are that you will find that they have been re-arranged.

3154. (*Chairman.*) You would not show lamp-posts or small objects of that kind?—No. I would show refuges, for this reason; if I were laying out an improvement in any way, I might have to take them into account, and if they were not shown I should have to get them.

3155. A lamp-post is a movable article?—A movable article, and I do not think it generally affects any lines of improvement that might be made. With regard to letter boxes I do not think there is any point in them: the only thing is if you are referencing for Parliamentary plans, a letter-box is a thing you are bound to reference and put a number upon, so there might be an advantage in having them, but you do not reference lamp-posts; they are dealt with by a general clause.

3156. But with regard to letter-boxes and ventilators, as city surveyor you would put them on to your own working plan?—Yes.

3157. You would do them for yourself?—Yes.

3158. For the general public they are no advantage?—I do not think so.

3159. Would you include the trees?—Yes, it makes the map more complete.

3160. (*Mr. Mather.*) You would show the paths?—I would show the paths. Some of the Ordnance plans show the details of public buildings. I think the plan I was looking at the other day showed the traceries of the ceilings in the Guildhall, and the thickness of the walls in St. Paul's Cathedral. That I do not think is desirable. That (a block plan), I think, is very much better: that is all the public want.

3161. (*Chairman.*) You would not deal with public buildings as regards their details in a different way from what you would deal with private houses. You would show them as a block?—Yes.

3162. (*Lieut.-Gen. Cooke.*) The Ordnance Survey do not show all that detail now. They have given that up?—I think that is quite right. There is no advantage, and there may be objections to it.

3163. (*Chairman.*) What is your objection?—It seems a waste of time, and I do not think the public generally want it. For instance, take my own case; if I want a detailed plan, I have it drawn to a larger and more useful scale.

3164. The scale is too small to be useful while it, giving so much detail, adds largely to the expense of the survey?—Just so; and I do not know that I care about the public knowing the whole of the plan of the Guildhall. The Governors of the Bank of England would certainly have objections to a plan of their place being published, for good reasons.

3165. You would show the line of the pavement?—The line of the pavement is useful, although not absolutely necessary.

3166. Are there any other improvements in the general style which you think you can suggest?—No, I do not think I can. I think, on the whole, they are got up very nicely and are very useful; at least I have found them so; I use them very largely.

3167. As to the 25-inch;—I use that too for showing our properties. The 5-foot you cannot get outside the Metropolitan area.

3168. Within the Metropolitan area, is the 25-inch map a useful map?—It may be for some purposes.

3169. You do not use it?—I do not use it; no.

3170. Have you any acquaintance with the smaller scale maps?—Not very much. The 6-inch maps I think we have used for some distant Metropolitan places where we could get them. We cannot always get them, by the way, for some districts. We have used them for those districts that are some miles away from London.

3171. (*Mr. Mather.*) Do you think there would be any difficulty in keeping the 5-foot map which you use for the city up to date, say year by year?—None whatever; I think, speaking at present without the authority of my masters, there would not be the slightest difficulty. Whenever I may have to do with the putting up of new public buildings, or altering the lines of old ones, or the lines of public streets, copies of the plans could be sent to the Ordnance Survey Office.

3172. And you think if you were working your office in connexion with the Ordnance Survey Department, the country would be able to obtain a map of the city of London kept up to date year by year?—Yes.

3173. And that would be a great public convenience?—Yes, I think to great public bodies and railway companies, for they transcribe a town very seriously. I think you would find that the maps can be kept up to date. I do not know how often the revision is done now, but it must be a serious matter.

3174. It is not done at all. Have you not found it an inconvenience in your own experience not to be able to get an Ordnance Survey map up to date, or within seven or eight years of it?—I have found it so. Only lately I had occasion to lay down some new streets we had made on the Victoria Embankment and near to Blackfriars Bridge. We bought a mass of property where the gasworks were, and none of the Ordnance maps were sufficiently up to date to show the new streets we had made, so I had to make myself all the plans.

3175. You see no practical difficulty in your department, or the department of the borough engineer, working in connexion with the Ordnance Survey Department to get this done?—No; I should make no difficulties whatever.

3176. (*Mr. Roby.*)—Do you think that such plans as the city surveyor could send to the Ordnance Survey Department could be accepted by the department without examination?—I do not think that would be wise. I think they ought to be tested, because they have to take the responsibility. When a man buys the Ordnance sheet he assumes it is reasonably accurate. If you are going to take everybody's plan without testing, you run a risk of error creeping in.

3177. (*Mr. Mather.*) But subject to that examination which Mr. Roby mentions, you think the Ordnance Survey Department might work with your department and from year to year produce accurate maps?—I should think so, certainly. I think if you could establish that as a practice it would conduce very much to the plans being corrected from time to time.

3178. Through the country, in all the towns of the country?—Yes, you ought to make it the universal practice.

3179. (*Mr. Brickdale.*) The Corporation, I suppose, have estates in all parts of the country?—Not in all parts of the country. We have a very large amount of property within London itself and outside the Metropolitan area, but not extending far into other parts of the country, or other counties.

3180. The home counties?—The home counties I may say.

3181. I suppose you have some estates which are being laid out for building?—Yes.

3182. And in respect of which leases are granted?—Yes.

3183. And you have also occasionally small sales?—Yes.

3184. Do you prepare plans for the conveyances that are made on these sales?—Yes.

3185. And also for the leases?—Yes.

3186. What do you generally prepare them from?—Our own plan. We adopt generally a larger scale, 22 feet to the inch. All my office plans are made to that scale.

3187. (*Chairman.*) When you are letting a house do you put a plan on to the lease?—Yes.

3188. On the 22-feet-to-the-inch or 20-feet-to-the-mile scale?—Yes.

3189. You do not think that the 5-foot scale is big enough?—No; it is not quite big enough for the purpose. At one time we put them on larger scales and gave details showing every fireplace and window, but we do not do that now. 22 feet to the inch is the usual scale we adopt. This 5-foot scale would be hardly big enough.

3190. Should you find any difficulty in enlarging a 10-foot plan so as to make the particulars on your leases exactly double the Ordnance scale?—The 22-feet-to-the-inch or 20-feet-to-the-mile scale is a multiple of the 5-foot to the mile which is 88 feet to the inch; that is why we adopt 22 feet to the inch, and the engineer of the City Commissioners of Sewers adopts 22 feet to the inch for the same reason.

3191. Supposing you are asked to furnish estate maps for legal purposes of any of the Corporation property, should you find the Ordnance maps satisfactory as to

Mr. A.
Murray.

1 June 1892.

Mr. A.
Murray.

1 June 1892.

basis of your plans?—Yes, as a basis. Now at this moment I am having the whole of one estate, the Bridge House estate, resurveyed, and new plans are being made. They are all being drawn to the scale of 22 feet to the inch, and we test them to some extent by the Ordnance 5-feet-to-the-mile maps.

3192. Do you make them by a separate survey or take an enlargement from the Ordnance map and correct it?—No; it is a distinct survey. You spoke of suburban estates just now. We have one we are just laying out, and there will be certain new roads made by-and-by, in the course of the next three or four years. If that is done, the arrangement we have suggested is that we should send you a plan showing these new roads, so that in your next issue they may appear.

3193. Supposing the Ordnance Survey were to publish, or issue in advance of your plans, skeleton plans, in your old sense of the word, showing the roads and the principal details, would that be a help to you in laying out your estate maps for the same districts?—No. I think not; when you come to such a scale as 20 feet or 22 feet to the inch you are getting into detail, and there I think it is better you should have a distinct and independent survey made, because a mistake of a foot is of some importance on a map 22 feet to the inch, but it scarcely shows itself on a scale of 88 feet to the inch. In enlarging we have found that. In my own experience in enlarging from the Ordnance, I have found that you cannot be certain that your plan will be exactly right; you may find yourself out 1 foot or even 2 feet. The very thickness of the lines has a little to do with it, and also the stretching.

3194. (Mr. Roby.) Is your scale exactly 22 feet to the inch, or is there a fraction?—Exactly.

3195. (Lieut.-Gen. Cooke.) I suppose whenever you have to make a survey such as you are talking of, you base it on triangulation?—Yes.

The witness withdrew.

MAJOR DUNCAN A. JOHNSTON, R.E., Secretary to the Committee, examined.

Major D. A.
Johnston, R.E.

3203. (Chairman.) You have placed before us two maps of the Isle of Wight?—Yes. The outline in one is printed from the copper plate, and the hills are printed from a duplicate copper plate in brown.

3204. (Mr. Mather.) What scale is that map?—One inch to a mile. The other map is a photo-zincograph map printed in five colours.

3205. (Lieut.-Gen. Cooke.) It is a map produced by photo-zincography from the copper-plate?—It is produced by photo-zincographing impressions from the copper-plate. The detail and contours are in black, the water in blue, the houses in red, the woods in green, and the roads in brown, these colours being all printed from separate zinc plates, and there being as many printings as there are colours.

3206. (Chairman.) Can you inform the Committee what would be the relative cost of the production of the maps?—I will obtain the information.

3207. Will you also add an estimate of the printing in addition to the cost of production?—I will.

3208. (Chairman.) You can also show us other maps?—I produce two Austrian maps on a scale of 1/75000, or .83 inch to the mile, smaller than our own 1-inch map, printed by heliogravure. I consider it is not to be compared with our engraved map. The distinction of the roads is well shown. I think the plan of showing inferior roads by a single line is a good one. On the whole I do not think it is so good in execution as the English map. I now produce a Belgian map on the scale of 1/40000, or about 1.6 inches to the mile. The whole of the hill effect is produced by contouring, but in all probability the contouring is not all instrumental. The contours are apparently at 5-mètre intervals. Contours put as close as this have almost the effect of hill shading; but as a graphic representation of hills it cannot compete with hill-shading.

I now produce some Belgian maps on the scale of 1/20000, or a little more than 3 inches to the mile. This map is printed in several colours; the contours are at 1 metre intervals, every fifth contour being printed in blue and the remainder in brown; and there is no hill-shading.

3196. The Ordnance Survey base their town maps on very accurate triangulation; it is much more minute than for the country districts. Suppose when a town was extending into a country district they were to extend the town triangulation without doing anything more, would that not be of great use to you?—Oh, yes, it would be of use; it would be perfectly useful for letting purposes, but when you come to cut up the land and to lease every separate house, then you have got to be a little more exact, and therefore a plan to a larger scale, such as 22 feet to the inch (20 feet to the mile), is much more useful than the 88-feet-to-the-inch scale.

3197. I imagine the triangulation would be sufficiently accurate?—It might be for the blocking of the property.

3198. That would do to base your survey on, because the most important point of the survey is to get the main lines accurately laid down?—Precisely.

3199. I dare say you have not the facilities the Ordnance Survey have of getting triangulation points done correctly, and taking the angles, and so on. If they extended their triangulation to wherever your town was growing, would not that be of very great use?—Yes; no doubt it would.

3200. (Mr. Mather.) That would provide for the extension of the city plans on lines originally laid down?—On lines originally laid down.

3201. (Chairman.) Do you find that your surveyors make these minor surveys for you by triangulation with great accuracy?—Yes; but there are wonderful differences amongst them.

3202. Some are good and some are bad?—Yes; I have two men now who are certainly excellent surveyors, and I can thoroughly rely upon them; but I have had others whom I could not rely upon. We find when we go to use the plan afterwards that they are not merely out in their length, but out in their angles, the whole sheet absolutely wrong.

I produce a map of Denmark on the scale of 1/80000, or about .8 in. to the mile. These Danish maps appear to me to be well printed, but to have the defect of trying to show too much detail. The second Danish map is on the scale of 1/40000, or about 1.6 inches to the mile. This map is a beautiful specimen of engraving, but it is so overburdened with detail that it is difficult to read. I now produce a Danish map, on the scale of 1/20000, or about 3 inches to the mile, dated 1885. That is no doubt drawn on stone. The contours are printed in light brown, there is no other shading, and the detail is in black. The water is probably coloured by hand.

I produce a map of France on the scale of 1/100000, or about .62 inch to the mile.

3209. That is the *carte vicinale*?—Yes. It is printed in several colours and shows a mass of detail, but to my mind is not at all a distinct or satisfactory map. It is overcrowded with names. The altitudes are printed in blue, and populations in red. Telegraph offices and post offices are shown, and double and single lines of railway are distinguished from one another. Six classes of roads are distinguished. I now produce a French map on the scale of 1/80000, or about 0.8 inch to the mile. It compares nearly with our 1-inch map. This map is engraved, and is published apparently in two forms, one printed direct from the copper, and the other printed by transfer to stone.

3210. (Lieut.-Gen. Cooke.) What is the reason for having the two processes?—The second is much cheaper than the other.

3211. (Mr. Mather.) This map has not been revised as far as you know?—No. I now produce a French map of Algeria on the scale of 1/50000, or about 1.4 inches to the mile. The hills are printed in brown, the roads in red, the water in blue, the woods in green, and the houses in red. I produce a similar map in which the hills are differently shown. In this case the map is contoured, with a little hill shading to show up the slopes.

I now produce a German map on the scale of 1/100000, or about .625 inch to the mile. The hills are shown by vertical hachuring. I also produce a German

Major D. A.
Johnston, R.E.

1 June 1892.

map on the scale of 1/25000, or about 2½ inches to the mile. This map is contoured at small intervals.

I produce a Baden map on the scale of 1/25000, or 2·5 inches to the mile, with contours shown in brown. Baden has a cadastral survey on the scale of 1/2500, but that is not published.

This is a map of Saxony, a very similar map. Both Saxony and Bavaria have capital maps.

I produce an Italian map on the scale of 1/100000, (about ·625 inches to the mile) showing contours and also hill shading. I produce a map of Florence, not quite so dark. I produce another Italian map on the scale of 1/50000, or about 1¼ inches to the mile. It is closely contoured and shows two classes of carriage roads, one which I understand to be macadamised or paved, and the other not always fit for wheeled traffic. I also produce two maps of the neighbourhood of Rome on the scale of 1/25000, or about 2½ inches to the mile, one coloured and the other uncoloured.

3212. (Mr. Roby.) Why do they have so many various styles in the maps?—They wish, perhaps, like we do, to improve.

3213. (Lieut.-Gen. Cooke.) There are probably maps of the different states before they were amalgamated?—Yes. On the 2·5-inch map they have a different mode of classification of roads to that used on the 1¼-inch scale. They have four classes of roads on the former.

I produce a map of the Netherlands on the scale of 1/50000, or about 1¼ inches to the mile. It is a very flat country and full of ditches.

I now produce two Norwegian maps on the scale of 1/100000, or about ·625 inch to the mile. The outline on them is produced by heliogravure, the hills are represented by contours and by a certain amount of brush shading.

I produce a map of the Balkan Peninsula on the scale of 1/210000, or about ½ inch to the mile. This is uncoloured.

I produce two maps of Bulgaria on the scale of 1/126000, or about ½ inch to the mile, one of them showing hills in brown or burnt sienna, and the other showing the horizontal contours so close together as to give almost the effect of hill shading.

I produce two Servian maps on the scale of 1/75000, or about ·8 of an inch to the mile. The contours are in brown, the roads in red, and the woods in green.

I produce two maps of Spain, colour printed, on the scale of 1/50000, or 1¼ inches to the mile. They appear to want revision.

I produce a map of Sweden and Norway on the scale of 1/100000, or about ·625 inch to a mile. I think the colouring is by hand.

I now produce a map of Switzerland on the scale of 1/50000, with contours printed in brown. I think that this is their latest map. These specimens are all selected by the Intelligence Department whom I asked to send me copies of the latest foreign maps.

3214. I do not think that is their only map?—They have a map printed in black, Dufour's map on the 1/100,000 scale, which I produce.

This is a Swiss map on a scale of 1/25000, or 2½ inches to the mile.

This is a United States map on a scale of 1-inch to the mile. It is contoured; all the water is printed in blue. That completes all the small scale foreign maps that I have got. I cannot say that the list is complete, but I obtained the maps from the Intelligence Branch of the War Office, who were asked to supply me with the best examples of foreign maps. I think it may fairly be taken that I have given the best examples of foreign maps that are published.

There are a few cadastral maps here. This is a map of Wurttemberg on a scale of 1/2500, or 25·344 inches to the mile. It does not show the same amount of small detail as ours. This is a smaller map of Bavaria; it shows no small detail round the villages. This map is on the scale of 1/5000, or 12½ inches to the mile.

3215. (Lieut.-Gen. Cooke.) Is that accessible to the public?—I believe these are, but there is no general map on that scale. Generally speaking, foreign countries do not publish their cadastral surveys. I

think it must be drawn on stone. It is a good map, so far as printing is concerned.

3216. (Witness continuing.)—This is a Belgian map on the scale of 1/5000, or 12½ inches to the mile, with an enlarged map of the village on the scale of 1/2500, or about 25 inches to the mile. In this Belgian map the enlarged village on a scale of 1/2500, shows no small detail, but, on the other hand, every house and its adjoining ground has a separate number. It is a great convenience having the map itself on the 12-inch scale, and the village on a scale of twice the size; 25 inches is a large scale for open country work.

3217. (Chairman.) That shows how practicable it is to number every plot?—If you get rid of all small details.

3218. (Lieut.-Gen. Cooke.) It is very fine writing?—Very fine writing.

3219. (Chairman.) Every property capable of being separately taxed or rated seems to be shown?—The Ordnance Survey could not undertake to do the same here unless it had a definite *locus standi* as regards ascertaining the boundaries of properties. In foreign countries these cadastral surveys are carried out by local authorities, and therefore they know the boundaries of properties.

3220. (Lieut.-Gen. Cooke.) Still we could put in every enclosure, never mind whom it belonged to?—Yes, but we should constantly put wrong houses with wrong gardens.

3221. They give the houses apparently?—Yes, including the garden belonging to it—381 includes a house and yard; 380, two houses and a yard.

3222. (Chairman.) No doubt this plan is made and numbered by the surveyor acting in concert with the parish official whom we should call the assistant overseer?—It would be utterly impossible to number each parcel separately rated unless the persons making the survey knew also the property boundaries. The Ordnance Survey could not carry that out because they have no means of ascertaining property boundaries.

3223. But if you had power you could?—Yes.

3224. The Ordnance Survey map will never be any good for valuation purposes until we get the smaller areas numbered and measured?—The Ordnance Survey can always give you the areas on their maps if you will give them the property boundaries; they can compute the areas without difficulty.

3225. For the above purpose a little difficulty arises owing to having all these trees and details on the map. The map requires to be clear of all that crowding in order to get room for the numbers and areas?—Yes.

3225a. (Witness continuing.)—I produce an Austrian cadastral map. It is in outline only. Additional information can be supplied on it on payment of the cost in accordance with a scale of charges.

I have also a cadastral map of the neighbourhood of Paris, produced on the scale of 1/2500, or about 25 inches to the mile, and also the communal schedules for rating or taxation purposes attached to it to show the method adopted in France of utilising the cadastral maps for that purpose. The very smallest parcels of land have a number of their own, and separate valuations down to 49 centimes.

3226. (Mr. Brickdale.) These are kept locally, and any little alterations are easily put in by hand?—Yes, you will understand this is not an original map, but a copy made by hand.

3227. Is this a completed map?—It is a completed, but not a published, map. It is a copy from the survey which is kept in manuscript.

3228. Reference numbers are not supplied on it?—A few reference numbers are on it. Being only a copy to show the system, it was not thought necessary to copy all the numbers.

3229-30. (Lieut.-Gen. Cooke.) Is that what the Ordnance Survey originally intended?—I believe so.

Adjourned to Thursday, June 2, at 11.30.

Board of Agriculture, 3, St. James's Square, S.W.

TENTH DAY.

Thursday, 2nd June 1892

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
 Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
 Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
 Mr. HENRY JOHN ROBY, M.P.
 Mr. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON, R.E., *Secretary*.

Major JOHNSTON further examined.

Major D. A. Johnston, R.E.
 2 June 1892.
 3231. (*Chairman*.) Yesterday you were showing us some foreign maps. Would it be possible for you to produce a table of the prices at which these maps are sold in the countries where they are produced?—Yes; I can do that.

3232. Will you be good enough to furnish the particulars to the Committee?—Yes, I will do so. (See Appendix VI.)

Mr. WILLIAM SPOONER TILL called and examined.

Mr. W. S. Till.
 3233. (*Chairman*.) You are the city surveyor of Birmingham?—The city surveyor.

3234. You have been in the habit of using the large-scale Ordnance town map?—Since the Department published those of Birmingham. They have not published them more than some two or three years, but in 1850 or 1851 the Commissioners of the Street Acts, the forerunners of the Corporation of Birmingham, commenced a survey of the district themselves, and that was kept up for some 15 or 20 years, but then it was neglected.

3235. Why was it dropped?—Owing to indisposition on the part of the town council to spend money at that time; I think that was about it.

3236. And then about two years ago you got your $\frac{1}{500}$ scale map?—We did.

3237. Is that a good map?—It is a very good map indeed; very useful to me and the surveyors of the district generally.

3238. Are you keeping up that map?—We are not. I am venturing to hope that the Ordnance authorities will see their way to do that.

3239. Are the plans of every new house—of every alteration that is made in the town—deposited with you?—They are.

3240. Do you look at your map to see how they will fit in on the town map?—Oh, yes.

3241. Would there be any difficulty in sketching in on the Ordnance map new buildings when determined on?—There would be no difficulty; it is simply a question of time, nothing more.

3242. And expense?—And expense.

3243. As a matter of fact you do not do it?—We do not do it.

3244. Consequently your town map will soon be obsolete?—Within a short interval of two or three years several alterations have taken place.

3245. Your town map goes into great detail?—It does.

3246. It shows all the lamp-posts?—Yes, and ventilators.

3247. Is it desirable that details so small as that should be put on the map?—I do not attribute so much importance to lamp-posts; but the sewer ventilators are of very great assistance to me, and so would the numbers of houses.

3248. Are they sufficiently permanent to put into a published map?—I think so.

3249. You do not think it would be sufficient to publish the map without those details, leaving you, for your own use, to put them in?—It would not be so valuable. If the Ordnance people did not do it, I certainly should.

3250. But those details are of no advantage to the general public?—No; I do not think they are.

3251. And they will be easily put on by yourself?—There is no doubt we should do it.

3252. The details of private gardens are shown on your map?—I do not care about the gardens; they are not important to me.

3253. Do you think the map would be better without them?—It would not have that finished appearance; there is no great value in them, I think.

3254. It adds materially to the trouble of revision, when such small details are put in?—Doubtless it does.

3255. Because they have to be revised as well as the main features?—That is so.

3256. If the map was therefore confined to the main features it would be easier of revision?—It would, and would be sufficient for my purpose.

3257. Would it be practicable for you to send to the Ordnance Survey Office once a year tracings of the Ordnance Survey map showing on the tracings all approved alterations carried out during the year?—The streets I would do with great pleasure, but buildings would be rather a serious matter.

3258. It would only be necessary to show altered buildings where the line of frontage of those buildings was altered?—Yes; but it so happens that in Birmingham we have a system of letting on 99 years' leases. Some 99 or a 100 years ago large blocks were laid out in that manner. Those leases are expiring or have expired, and great alterations are in progress, so that it would mean to a great extent a new survey.

3259. That is to say, there would be new streets?—New streets and altered lines of streets and fresh buildings too.

3260. Cutting through?—Cutting through.

3261. But you are supplied by the persons undertaking those works under your byelaws with accurate drawings, or at all events builders' drawings?—That is so.

3262. Of all those streets and buildings?—Yes.

3263. Would there be any difficulty in your office in putting them on to a sheet of the survey?—No, there would be no difficulty. As I say, it is a question of

time, and (as you suggest) cost. If the Ordnance Survey do not do it, I think I shall have to recommend the Council to do it.

3264. Supposing Southampton was to be supplied with these maps, would it not make revision very much easier for the Department?—I should think it would.

3265. Do you think it will be possible for them to adopt those drawings for their plan without examination?—I am very doubtful upon that point.

3266. It would enable the examiners of the Ordnance Survey to go on to the spot where the alteration had taken place to test the accuracy of the drawings, and make any corrections necessary?—That is so. As an illustration, at the present time I supply the parish valuers with the lists of all alterations which have taken place or new buildings which have been erected.

3267. Under your byelaws the frontage of buildings has to be shown to you?—Yes.

3268. Would the back frontage (if I may use that term) also be shown?—A man cannot add to his buildings, either at the front or back, without first of all submitting plans.

3269. So that practically the approved drawings sent to your office do represent what is actually carried out?—Yes, but in some instances they are not drawn to scale; they are simply sketches; you can simply get an impression that alterations are about to take place; you could not depend upon them for scaling purposes.

3270. Would there be any difficulty in your insisting—by altering your byelaws if necessary—on their furnishing you with drawings on the 10-feet scale?—I think the owners of property, builders and architects would create great difficulty about it.

3271. Do you think it would be a great hardship in case of a man doing, say, 100l. worth of work, in his being obliged to put it on a 10-feet scale map?—I would let them come to my office, if so desired, and trace as they now do from our sheet, but many of them are in a small way and would not like to spend 2s. 6d. on a map. So far as I am concerned I should be perfectly willing to render every possible help in that way.

3272. You think that such a scheme as I have been suggesting could be worked out with advantage?—Yes, I think it could.

3273. Would there be any objection to making it a legal obligation on county councils and corporations and on official bodies of that class to send drawings of this class of which they had official knowledge to Southampton?—I take it that all you would require would be a drawing on your large survey scale of the block plan, the general arrangement; you want nothing more. I do not think there would be any hardship in it.

3274. (*Mr. Roby.*) The expense would not be serious?—No, it would not be serious.

3275. (*Sir A. Geikie.*) Is it your belief that the accuracy of those local plans would be sufficient?—In many instances it would be very doubtful. I take it you would have to send one of your men down to verify these. For instance, lots of men who make alterations will employ a small builder, who will send us a plan perhaps drawn in pencil, but sufficient for my purpose; but I could not say that would be good enough for the Ordnance Survey to put at once on their sheets.

3276. (*Mr. Roby.*) Do not you have in your office some surveyor who could put it down correctly on the Ordnance plan before you sent it down to Southampton?—That means my sending on to the ground to survey.

3277. (*Chairman.*) Can you give us any idea of how much time it might take in your office to put the alterations, made in Birmingham in any one year, correctly on to your map?—No; it would be a very random shot.

3278. The alterations are very considerable?—Very considerable indeed. In addition to the growth of the place itself the mere fact of the expiration of leases and the landowners dealing in a fresh way with their properties is an important factor. I do not think you could have a worse time for doing that kind of work in Birmingham than at present. Building in Birmingham must have made a great spurt about a 100 years ago; the leases are now expiring and landlords are rearranging their estates.

3279. Do your large-scale Ordnance Survey maps extend sufficiently far over the suburbs to cover the growth of the buildings?—No, it did not in the first instance when published, and I communicated

with the authorities and they were induced, by our paying them something between 400l. or 500l., to add considerably to the area on the 1/500 scale. Further additions are now needed in the old city; we have recently extended the city by taking in adjacent districts comprising about 4,600 acres, and the large-scale survey requires extending there also at the present time.

3280. For present purposes would it be enough if minor trigonometrical points were established all over that district and supplied to you?—That means my having a staff.

3281. I mean by the Ordnance Survey?—You speak only of giving me trigonometrical points.

3282. (*Lieut.-Gen. Cooke.*) You know that the Ordnance Survey is based on triangulation?—It is; ours was some years ago.

3283. As the scale of the survey increases the number of points are increased necessarily?—Yes.

3284. Of course the Ordnance Survey have great facilities for establishing what we will call the minor triangulation, because they have the points of the greater triangulation firmly fixed, and can work within them, and that is an advantage which no city surveyor has. The question is when you want to extend the large-scale map to your suburbs, supposing that the Ordnance Survey are not in a position to undertake the whole survey for you, would it not be a very great advantage if they were to undertake the minor triangulation?—Doubtless it would.

3285. The advantage of that would be that anything you did would be easily referable by the Ordnance Survey to new plans, because they would have these same minor points on their plans, and you would have the minor points on your plans, and the whole would be easy of reference and adjustment?—Doubtless that would be so.

3286. That you have no doubt of?—Not at all.

3287. Is it useful to show on a new and complete map all buildings and structures, dilapidated farm buildings, and so on, which are about to be swept away?—Yes, I think so. There is a 10-chain map which I have recently had corrected so as to include the present city. (*Witness produced the map.*) There is a district taken in; here is another in the same way—a densely-populated district; a district here has been also newly added. Now, that is a most useful map for general purposes; of course it is no use for detailed purposes.

3288. (*Mr. Mather.*) If these extensions had been based upon the triangulation of the Ordnance Survey it would have been of great advantage to you?—Doubtless it would have been very much better than it is. This is a cooked-up map.

3289. (*Sir A. Geikie.*) Is this in any degree taken from the Ordnance Survey?—We started a survey of our own in about 1848-50, and from time to time we have corrected it, and with the assistance of the plans I have had in the office from the authorities we have compiled this map. It is simply a compilation.

3290. Have you got the 25-inch map of the district outside Birmingham finished?—Yes, I believe it is finished; at least it is finished for Birmingham and some little distance round, and we have used several copies of it already.

3291. (*Chairman.*) That is a more useful map for your purposes than the 6-inch?—It is.

3292. But it is not large enough for plotting building operations upon?—No; you could not plot building operations upon it. This is the 6-inch map.

3293. Of course that is too small?—It is too small, and it cuts into a good many sheets. For instance, to get Birmingham complete on the 6-inch scale takes 12 sheets, which cost 12s.

3294. Then you would ask the Ordnance Survey Department to publish a combination map for Birmingham?—For Birmingham and the adjacent district. Here is a part outside the city; to all intents and purposes it is part of the city.

3295. (*Sir A. Geikie.*) The scale is too small?—The scale is too small. If it were a question which I should do without, I should do without the 25-inch and keep to the large scale.

3296. (*Mr. Mather.*) What is your scale?—I am speaking of the scale of 10 feet. I would rather be

Mr. W. S. Till.

2 June 1892.

Mr. W. S.
Till.

2 June 1892.

without that (the 25-inch) than without the 10-feet. I am very glad to have both.

3297. Do you think 5 feet would be large enough for a town? You know that is the scale of the London map?—I do not know it.

3298. We had a surveyor here yesterday who preferred the 5-feet to the 10-feet?—I cannot go so far as that.

3299. (*Lieut.-Gen. Cooke.*) That was only if it was engraved; this would not be engraved?—No.

3300. (*Chairman.*) Supposing you were able to furnish persons making building alterations gratuitously with sheets of the 10-feet plan, and put them under an obligation to put their plans on to that sheet and return it to you, would that be a workable scheme?—I do not think it would.

3301. Nothing would induce the ordinary run of builders to send in plans?—They would have to go to a surveyor; they would never incur the expense.

3302. Would the expense be serious to a man putting up a building, say, of 100 feet frontage or a 20-feet frontage?—They would consider a matter of expenditure of two or three guineas a great deal more than they should undertake, I am sure.

3303. I suppose that if a man was going to alter a 20-feet frontage house, and he gave you a fee of 10s., it would well cover any expense in your office of putting it on to the Ordnance Map?—I dare say it would. I do not want to receive any fees in any shape or way.

3304. (*Lieut.-Gen. Cooke.*) What you are now saying applies, I imagine, more to the small builders?—It does.

3305. Supposing there were very large alterations going on done by men in a large way of business, good architects and good builders, would they have the same objection?—No, I do not think they would; but they would expect to be paid for it.

3306. If an Ordnance Survey map is given to them comprising the area they were dealing with, do you think they would object to putting the alterations on to it?—I have in my mind more than one man who would decidedly object; in fact he objects to give me even a plan at all.

3307. (*Chairman.*) You are aware, I dare say, of the Act of Parliament by which every person who publishes a book is bound to send three copies to certain places?—Yes.

3308. Would there be any greater hardship in putting this requirement on persons making alterations to buildings than on those persons who produce books?—I should think there would be a greater hardship.

3309. Because in the case of books there is a greater number?—Yes, if a man publishes a book, the fact of printing a few more copies does not matter.

3310. (*Lieut.-Gen. Cooke.*) At all events these plans which are sent in to you are sufficient to identify the locality of the alterations, are not they?—Yes; they have to send a sketch map accompanied with the others.

3311. (*Mr. Mather.*) In reference to this same map, I should like to ask you whether you could carry out the idea which you see is in the Chairman's mind of getting the local authorities to work in connexion with the Ordnance Survey Department, and to have year by year a revision of the town; would it be, in your opinion, practicable and wise for the Ordnance Survey Department to establish in various centres of the country an office with an officer residing there for the purpose of keeping up information as to new works, new roads, and so on in the town, working with the town authorities on the spot, and obtaining from the borough surveyors and borough engineers and other officers the information necessary for his purpose (maps and plans, and all sorts of information), and then himself becoming responsible for transmitting to the Ordnance Survey Department the information necessary to revise the maps?—That would seem to me to be a good solution of the difficulty.

3312. His functions would be not only in reference to a town, but he would take also a county district around a town, a certain portion of each county, and keep up their maps as well as the town maps?—It would seem to me to be a plan to be desired.

3313. And would cover all the difficulties you have suggested?—I should have no difficulty in affording

him access to any information I possessed, or in giving him copies of anything deposited with me.

3314. And coming through him of course the information would arrive at the Department absolutely correct?—Yes.

3315. (*Chairman.*) Do you think that an Ordnance Survey officer having the right to go into the borough surveyor's offices generally and turn over the plans there, would be satisfactory?—I should have no objection to it.

3316. (*Mr. Mather.*) The representative of the Ordnance Survey Department would take all the trouble on the spot, and use you and your office and people without the trouble and cost you have spoken of?—I was assuming this resident officer would either have access to my office or to any plans I possessed, and I would give him any information in my power. Whoever might be deputed to that office I think would have about 50 per cent. of the work to do. Take the case of an agricultural estate being converted into a building estate; plans and sections of the streets and sewers are forwarded to my office for approval before anything is done. All that there would be no difficulty in letting you have copies of; but I do not think that you would see your way to trust these architects and surveyors and others to make these plans with sufficient accuracy for the Ordnance Survey.

3317. But supposing the Survey Department had such an officer in the district?—He may do it.

3318. Do not you think, as a resident in the district, and knowing about these things, it would be very easy for the architect and surveyor to fall into the custom of informing the Ordnance officer of what he is going to do?—As a rule an architect is not a surveyor.

3319. Those who lay out the ground?—The land agent in the first instance could do it; whether he would think it a hardship or not I cannot say. They would want a fee for it in some shape or other.

3320. Of course it would show an utter want of public spirit on the part of either the private landowners or the public authority if they would not work with an officer placed there to keep their plans right?—They are apt to think the requirements of corporations are rather hard upon them at the present time.

3321. (*Mr. Brickdale.*) The plans supplied to you are plans of proposed alterations?—Proposed alterations to buildings, yes.

3322. Have you any means of seeing that the alterations are carried out as proposed?—I have a building surveyor with me with a staff of assistants to see that generally they are carried out.

3323. So that any great deviation in the plans would be reported to you?—They would be reported to the office.

3324. (*Mr. Roby.*) Suppose they dropped a thing altogether?—They do often; they get approval of plans which are not carried out.

3325. Should you get notice if things are dropped?—No, but the inspection would tell us.

3326. (*Chairman.*) Has Birmingham contributed anything towards the cost of the Ordnance survey?—Yes, for the large-scale maps.

3327. On account of some area which you wanted taken in and which the Ordnance Survey were not prepared to survey?—They did not extend it to suburban districts, Edgbaston particularly.

3328. Do you know what you paid them?—I do not remember how much. It was something between 400l. and 500l.—420l. or 430l.

3329. Was there any dissatisfaction with the price charged?—It was a price quoted by the Department, and recommended by me to the Council.

3330. It was a reasonable amount?—I think it was.

3331. With regard to the price of the plans, it varies from 2s. 6d. for a skeleton plan up to 20s. for a coloured plan where the buildings are crowded?—Yes.

3332. Do you consider that that is a very high charge for colouring?—I do not know that it is a high charge for colouring, but it is such a charge that I do not think you will find many purchasers.

3333. It is a prohibitive charge?—I think I have already said that this small-scale map, without any colouring at all, costs 12s. for the sheets alone. Very few people would buy those maps.

3334. Your map is a skeleton map?—A skeleton map. When I have sold them I have sold them for 2s. 6d. each.

3335. Supposing, that instead of selling the map as a skeleton map it was sold with diagonal hatching on the buildings?—I think I know what you mean. My own survey in the first instance was etched.

3336. Will you look at that hatched map?—That to my mind is sufficient for all purposes without colouring, and better without.

3337. You would be quite satisfied with one edition like that?—Quite.

3338. No skeleton and no coloured map?—I should be quite content with that.

3339. Is the character of the hatching satisfactory there?—It is perfectly satisfactory to me. I have not a suggestion to make with reference to these maps.

3340. Do you think that if the town map were revised and republished once in five years that would be adequate revision?—I do.

3341. And if the map could be kept in such a condition at Southampton that anybody applying to the Ordnance Survey for a tracing of any portion might have a map corrected up to within 12 months (not a published map but a tracing of a corrected map), do you think that would be satisfactory?—Yes; they have kindly supplied me from Southampton from time to time with tracings of anything I wanted.

3342. That would be a satisfactory arrangement, viz., an obligation on the Ordnance Survey to supply a tracing up to date every year to anybody applying for it, and a published map every five years?—They have been very good in letting me have maps of the city extensions out of the ordinary course, and I cannot speak too well of them.

3343. The levels are marked on your 10-foot map?—They are.

3344. Are they sufficient in number?—I think so. I think on the smaller map contours are given at every 100 feet. If they were given at every 50 feet in flat districts it would be more advantageous.

3345. That is the 6-inch map?—The 6-inch map.

3346. (*Lieut.-Gen. Cooke.*) In flat districts?—Yes; 100 feet is nothing at all.

3347. (*Mr. Roby.*) I suppose you call Birmingham flat?—No, we have a rise of 350 feet from the extreme east to the extreme west, but there are portions which are very flat.

3348. (*Chairman.*) On your 25-inch map are there levels shown over your back streets as well as over your main streets?—Oh, yes.

3349. Is the character of the 6-inch map satisfactory to you?—Perfectly.

3350. Is this an engraved one or a photo-zincographed map?—Simply photo-zincographed.

3351. I mean the 6-inch map; there are two qualities of the 6-inch?—I am perfectly satisfied with it.

The witness withdrew.

Mr. GEORGE FREDERICK CHAMBERS called and examined.

3366. (*Chairman.*) You are a barrister and resident at Eastbourne and have been at times employed as assistant commissioner under the Local Government Board?—Yes; and I am an officer in the 1st Sussex Engineer Volunteers.

3367. And you have sent some remarks to our secretary with reference to the 1-inch map?—That is so.

3368. You say that the existing map, by which you mean the new map, does not well subserve the purposes of pedestrian tourists, cycling or driving tourists?—The new 1-inch map seems to me to be too full of unnecessary and inconvenient detail having regard to its scale, detail which would have been more conveniently reserved for the 6-inch map; and I have found, in a great deal of walking over Kent, Sussex, and Surrey, that, on the whole, the old 1-inch map was more generally useful to me for finding my way about than the new one.

3369. What additional information does the new 1-inch map contain beyond the old 1-inch?—It contains a large number of roads which I suppose would be regarded as

3352. Have you any remarks to give us on the 1-inch map?—No; I used to be very fond indeed of the map; for general purposes it is a splendid map, but it has not been revised for many years.

3353. Have you got the new 1-inch map yet?—No.

3354. Major Johnston tells me you have already had the advanced edition?—I have not seen it yet.

3355. When you say it is a beautiful map, you are speaking of the old engraved map?—I am speaking of the old 1-inch. It was a beautifully got up thing.

3356. (*Mr. Roby.*) When you get plans or maps, do you get them direct from Southampton or through a local bookseller?—The bulk of them come through local booksellers. There are certain "specials" which we can only get from Southampton.

3357. Is any stock kept in Birmingham?—Not a large stock. You can imagine we had a great rush during the preparation for the Parliamentary extension, and there was great difficulty in getting some of the sheets. But for special efforts at Southampton I do not think we should have got them.

3358. How many people in Birmingham are in the habit of buying Ordnance maps?—I think you will find that pretty well all the surveyors and architects of any position have obtained copies, and I am very thankful that they have, because prior to their doing so, they used to be continually at my office taking tracings of the old survey, and then they would go on to the ground and correct it.

3359. Do you think there is any large sale in Birmingham to the general public for the 6-inch or 1-inch maps?—I think for the 6-inch and 1-inch there might be; there would not be for the large scales.

3360. (*Chairman.*) You have had considerable alterations of boundaries round about Birmingham lately?—Yes.

3361. Do you think it is desirable or necessary that those boundaries should be at once put on the published map, or would it be sufficient if tracings of these altered boundaries were supplied to persons requiring them?—So far as I am concerned, I prepared maps on the basis of your 6-inch map for the gentlemen who came down from the Local Government Board, and they were signed by them and by myself and taken as authoritative documents, and I have from time to time coloured others in the same manner. I do not know that the boundary is very important to a very large number of people.

3362. You would not propose that alterations should be put on the published maps immediately?—I should not press that myself.

3363. Of course that would involve the destruction of the old edition?—I should think that present wants are supplied with regard to this very much.

3364-5. You are under the same obligation as the county council to send copies of any altered boundaries to the Ordnance Survey, Southampton, as for instance of that map, are you not?—I am not aware of it.

occupation roads, but which as you find them on the map are, I think, very ensnaring.

3370. Were not all those on the old 1-inch map?—No.

3371. (*Chairman.*) Have you the two maps—the old and the new—that you can compare?—Yes. I can give you an instance which came under my notice two or three weeks ago at Leith Hill, near Dorking.

3372. What are you producing now?—I am producing the old 1-inch and the new 1-inch of the district round Leith Hill, and I find there a certain track, indicative, as I suggest, to a stranger of a convenient road.

3373. (*Lieut.-Gen. Cooke.*) On the new map?—On the new, which when I traversed it on foot, I found was barely a bridge road, and was barred and looked at the further end, and I had to climb over the gate.

3374. It was a road, then, but it was a private road?—I do not think in that particular case you can call it a road.

3375. Is not a road equally a road, whether it is a private road or a public road?—Well, I would rather

Mr. W. S. Till.

2 June 1892.

Mr. G. F. Chambers.

Mr. G. F.
Chambers.

2 June 1892.

define a road to be a place which you can travel over tolerably safely with a wheeled carriage.

3376. How can the Ordnance Survey Department determine which is a private road and which is a public road?—Well, I would not suggest. Of course, I see the difficulty as to that; but I do suggest that the new 1-inch map contains too often lines marked indicative of roads which actually are not roads in fact, and which are not more than footpaths.

3377. (*Sir A. Geikie*.) But in this particular case how would you propose that the Ordnance Survey should indicate that road?—I think by a single line of dots instead of a double line.

3378. (*Chairman*.) How is it marked on the old map?—It is barely marked at all, except just down at the lower part.

3379. That is because the plate is worn out?—I can give you another instance in Sussex. There is a line which I traversed on foot which I marked with dots accordingly, which has no mark on the old map, but which on the new map is marked with a double row of dots.

3380. (*Lieut.-Gen. Cooke*.) That is the characteristic of a minor road?—Well, now there is an instance in which it is, in no valid sense at all, a road. It is marked as a minor road and ends in a narrow stile which you cannot get through and never could have got through otherwise than as a pedestrian.

3381. You mean it is no more than a footpath?—Yes, and should have been shown as one.

3382. I think we had better refer that to Southampton?—I will tell you what I will do. In the course of the next three weeks I shall be travelling about a bit, and I will make notes of a number of these cases and collect them, because had I done so I could have produced a number of cases where tracks almost invisible are marked with that double line.

3383. (*Chairman*.) The rule apparently is that no double line is to be used to indicate a road unless a carriage can get through, and even if there is a gate it is capable of being unlocked, a stile should reduce you to a single line?—I am quite satisfied with that distinction.

3384. That is the distinction intended on the Ordnance maps?—I suggest that that distinction is not borne out by the facts of a very large number of cases which I have personally seen.

3385. (*Lieut.-Gen. Cooke*.) Could you send us in one or two in a few days?—I was thinking of sending them to Southampton.

3386. (*Chairman*.) Could you send to us a tracing showing the errors?—I will.

3387. I now put into your hands the sheet of characteristics, and I ask you whether, if the roads and footpaths are shown as intended they would be satisfactory, viz., sufficiently distinguished from one another?—Well, I would reply to that that the first and second classes of roads, I think, are satisfactory; but I do think with regard to the third class that the 1-inch contains in too many instances roads indicated as minor roads which are not and never have been roads in any fair sense of the word at all, but are practically cart-tracks to a farm, cowhouse, or something of that sort and in many cases only a bare footpath.

3388. Have you any other points with regard to roads?—No, I think not, with regard to roads; but there is perhaps this point which should be mentioned. Parish boundaries are very often run along roads and in the 1-inch are indicated by dots, and those dots mar the view of the road altogether, so that when you come upon a road, and find it dotted, it distracts the eye very much. I suggest whether parish boundaries ought to be marked at all upon so small a scale as 1-inch. It does not seem to me (as a sort of court of appeal) that that map is sufficient for dealing with boundary questions. The dots spoil the map for travelling purposes.

3389. Perhaps you would suggest that if parish boundaries are wanted on the 1-inch map, they should be made the subject of a separate edition?—Certainly; I think that would meet it. I would even go one step further and think that parish boundaries would not be wanted on so small a scale as 1-inch unless by private individuals for some very special purpose. I question whether for general sale they should be put on the 1-inch.

3390. That would be met by a separate edition?—Yes.

3391. In the old 1-inch map there was a separate edition?—The old 1-inch map had no parish boundaries.

3392. There was a separate edition?—I do not remember that.

3393. You object to the way in which the parish names are printed?—That is another point in what I call the disfigurement of the new 1-inch. Some years ago I was preparing for a local guide-book of mine a map of the district round Eastbourne, and this was the ultimate result of it (*producing map*); and I bought, for the purpose of preparing for photo-lithographing them, the neighbouring maps; and after I had got them put together I noticed that the parish names had been put on the newer purchases and not on the older ones, and I could not get at that time a complete set of the new 1-inch maps unmarked. If you compare the two together (I happen to have saved up the one I purchased), I venture to suggest that the old one is decidedly more clear than the new 1-inch. You see they leave out the parishes. I fail to see why those names should ever have been put on the 1-inch, because they are given adjacent to the actual centres of population, which give their names to the parish; and then, again, the dedication of the churches to the saints seems to me to be decidedly wide of the intention of a 1-inch map.

3394. (*Lieut.-Gen. Cooke*.) That is not done now?—It is a very useful and interesting archaeological and antiquarian matter but no more.

3395. They are merely marked "church" now?—I think that is quite enough.

3396. (*Mr. Roby*.) Do you miss the hill-shading in the map?—In what sense, may I ask, do I miss it?

3397. Do you find the map for your purpose as useful without it?—No; I do not think I do.

3398. (*Mr. Mather*.) The contoured map, do you mean?—What I mean is that the general public comprehend hill-shading, and do not comprehend contouring.

3399. (*Chairman*.) Do you know Waldron?—Yes.

3400. There is no parish called All Saints?—No.

3401. All Saints is the name of the church at Waldron?—Yes. Then, again, as regards the 1-inch map I cannot help thinking that too many insignificant properties are recorded upon it—I mean very small properties such as villa residences. It pleases, no doubt, the owner of the villa to see his name upon the Ordnance map, but I think it is done too often. I am looking at the matter from the standpoint of the map being inconveniently crowded with names not of general usefulness to the classes of people who use the 1-inch.

3402. (*Lieut.-Gen. Cooke*.) Have you an instance there?—Yes, I will give you one, on the road from Hailsham to Eastbourne.

3403. (*Sir A. Geikie*.) These remarks apply to certain particular sheets. You do not apply your remarks to the whole of the new 1-inch map of England?—I imagine the principles which I am dealing with practically apply to the whole.

3404. I should like to make that quite clear. I produce Sheet 187 (Huntingdon) of the new 1-inch map; do you think that is too crowded?—No, I think that is very different. It is suggested there is nothing to put on it.

3405. There is a great deal to put on it. This is Huntingdonshire?—I should have been very much better pleased if I had been able to work upon a sheet like this when I was preparing my Sussex map.

3406. It is important to indicate the particular part of the country you are referring to?—I am speaking of Surrey, Sussex, and Kent more particularly. Here is a little villa here called Meyerton House. I happen to know it was built 15 years ago by a Jew named Meyer. It is a mere Italian villa, and stands on perhaps 5 acres of ground. It has been sold since, and is now called Woodside. I do not think it ought to have been put on.

3407. (*Chairman*.) Do you not think that isolated houses should have their names attached to them, provided that can be done without unduly crowding the map?—Yes, I may answer that question in the affirmative, and I would by all means include isolated houses which, by the evidence of the old map, have borne their names for something like a considerable period,

and estate names belonging to great landowners, and farm names which do not change at caprice.

3408. (*Mr. Roby.*) You think it desirable that all the villas with an acre or two of land round them in the neighbourhood of growing districts should not be marked?—I think so.

3409. (*Chairman.*) With respect to this particular house, it does not appear that there is any other house within a mile on either side of it?—That is true.

3410. On this square of the map is there any other house besides Meyerton House which you think is superfluous?—I do not know that I can say straight off; possibly not.

3411. (*Mr. Mather.*) Do you find that the Ordnance map contains all these villa residences such as you have named, or do they use some sort of discretion already?—I suppose they do use some sort of discretion, but I think the discretion should be carried a little farther.

3412. (*Chairman.*) Do you think there are as many names on the new Ordnance 1-inch map as there were on the old 1-inch?—Yes, many more I should think.

3413. Supposing the parish names were taken out of that sheet of Sussex, should you think that would be unduly crowded?—I think it would be still unduly crowded for the purposes which I assume a 1-inch map is only wanted for. Here is the old tithe map of that district. If you as a stranger were to take these two maps separately in your hand and drive through the district and try to find your way mile by mile, I venture to say you would be quicker and safer in doing it by the old 1-inch than by the new 1-inch.

3414. Is that due to the greater perfection of the engraving of the old map as compared with the new map, or is it due to the overcrowding of the new map with names?—I think—due to the overcrowding with names and marks, roads which I venture to say are not roads, and parish boundaries which I venture to suggest had better not be there.

3415. That is the new 1-inch map with the contours upon it?—Yes.

3416. Do you think those contours embarrass you?—I think they do rather.

3417. Supposing the contours were printed in colours, would that objection be got rid of?—Yes, certainly; these are roads which I have personally walked over and can speak of from personal knowledge.

3418. (*Chairman.*) Now with regard to the spelling. You find fault that the old map and the new map do not agree?—Would you kindly look at this, which is a very flagrant case (sheet 319 of the new 1-inch). Gnat Wood, I think, suggests a wood frequented by gnats; it comes out "Nate Wood" in the new edition.

3419. (*Lieut.-Gen. Cooke.*) Have you any means of knowing which is right?—I have no special means of knowing, but I think the suggestion is obvious.

3420. (*Chairman.*) Are you aware that everyone of these names is now put upon the map on the authority of three persons?—I only learned that for the first time the other day from your letter. Another practice in the new map, which seems to me objectionable, is that of spelling a compound name without a capital for the second name. "West Dean" is spelt on the old map as two words with a capital W and a capital D, and on the new map as one word, thereby spoiling the meaning of the word altogether, "West" being an adjective to distinguish West Dean from East Dean, which is another place.

3421. On the new map is that name compounded?—I think so. Here is another case: Leith Hill is correctly spelt on the new map as two words, but the property down below, which has long been known as Leith Hill Place, is spelt as one word.

3422. (*Lieut.-Gen. Cooke.*) It may be so done if the owner of it has always used "Leithhill" in that way as his direction, I do not think it follows conclusively that it is an error?—I do not know that it is conclusive. "Deer Leap" is spelt in the old map as two words, the leap of the deer.

3423. Of course one must go to the people who have authorised this spelling or recommended it, and see what they had to say about it?—I cannot help thinking that in a great number of cases where compound words are now spelt as one word, it has been done without any special authority or instructions, and I say has spoiled the original meaning of the word.

3424. (*Chairman.*) What have you to say with reference to the public being allowed to reproduce the maps of the Ordnance Survey?—I understand that the public are forbidden to reproduce the 1-inch map in facsimile, that you must take a scale either fractionally over, say, one-sixteenth over, or fractionally under, fifteen-sixteenths.

3425. In order to comply with the objections of the Treasury?—That is it.

3426. Do you think that the nation, having spent an immense sum of money on producing the Ordnance map should allow every person to use it in any way they please?—Well, I would say that people do use it. I mean to say the spirit of your point is frustrated by what I myself have done, just taking a fraction over the inch and photo-lithographing the whole thing bodily.

3427. (*Mr. Roby.*) You do not think it would make any practical difference if they were allowed to copy exactly?—No.

3428. You do not think it would diminish the sale of the Ordnance sheets at all?—I do not think so. Here is a photographic reproduction below 1-inch, I think it is a $\frac{1}{2}$ -inch (*producing map of Sussex*). If the gentleman who got out that map for the East Sussex Hunt had been at liberty to reproduce his part of the county on the exact 1-inch scale, he would have done his work more conveniently for the purpose of the people who are going to use it, and yet, I think, without in the least degree interfering with the copyright sale of the 1-inch.

3429. (*Sir A. Geikie.*) If he produced this map at 1s. and the Ordnance map is 2s. 6d. or 3s., do not you think that would affect the sale of the Ordnance map?—You might make this intermediate condition, that no single sheet by itself should be reproduced in absolute facsimile on the 1-inch scale. I have referred to my own case, but that is a usual case, I think; I have portions of four single shilling maps, and I had to cut out those portions I wanted and piece them together to make the one compact portion which I wanted for my territory.

3430. Do you think the law of copyright should not be enforced as regards the Ordnance Survey publications?—I think that is what it amounts to.

3431. (*Lieut.-Gen. Cooke.*) Would you not enforce it with regard to the reproduction of one single sheet alone as a facsimile?—Yes, I would grant that.

3432. (*Chairman.*) Supposing the Ordnance Survey Department publish a combination sheet, as of Brighton, which is the putting together of three or four sheets and publishing them as a new sheet, a combination sheet, could that be defended by the law of copyright?—I think that might be, because the Government are then providing what, according to my line of argument, the private publishers would have provided.

3433. So long then as a publisher confines himself to providing a map different in scale or extent to that which the Ordnance supplies, you think no restrictions should be enforced?—No restrictions should be enforced.

3434. (*Mr. Mather.*) And no payment should be made to the Ordnance Department?—No, I do not think so.

3435. Would you go so far as to say that the Ordnance Survey Department might leave to the public the publication of all their maps, and have perfect free trade in maps subject only to the royalty paid to the Department?—No, I do not think so. I entirely approve of the principle of the Ordnance Survey Department retaining the first-hand control over the maps as Government official publications. I am only pleading for increased facilities for the republication of local areas.

3436. Are they practically restricted in any way now?—Oh, I think so; because when I was talking over that photographic reproduction with my publisher he warned me that I must do something different from the 1-inch, and very inconveniently to myself and my readers, I took a $\frac{1}{2}$ -inch scale which is nothing; I mean it is no defined scale.

3437. What objection would there be to your reproducing exactly the Ordnance map in cheap form. We saw, for instance, some maps produced by Edinburgh firms, not exactly copies of the Ordnance map, but simply changed in regard to scale, and they were

Mr. G. F. Chambers.

2 June 1892.

Mr. G. F.
Chambers.

2 June 1892.

very beautiful productions and answered the public purpose. Why should not they do this, the maps being practically an exact copy of the Ordnance map?—I do not see any reason why they should not. If you go into the question of colour—

3438. Excuse me, I wanted to refer to the answer you gave just now. You said the Ordnance Survey Department ought to retain in their own hands the sale of the actual map on the scale on which it is produced, and the public might copy it in some other scale?—What I meant was this: I think that there always ought to be maintained a Government department publishing maps which have the *imprimatur* of the Government department. I do not advocate a general free trade in maps.

3439. That is for the production of the maps?—Publication.

3440. Do you think it is wise for the Government department to continue publishing these maps?—Yes, I do not see any objection to that.

3441. (Chairman.) You suggest in your memorandum to the Committee that you want a 2-inch map?—I think a 2-inch map very much rid of detail is desirable.

3442. (Mr. Roby.) Supposing your publisher could have got from the Ordnance Survey permission to reprint their map on the same scale by paying them a small acknowledgment, do you think there would have been any objection to that course?—Well, there would be no objection in one sense.

3443. Would your publisher have objected to pay some small royalty and then enter into some contract as regards the number of copies and the style in which the thing should be brought out, so as to prevent it being made a purely competing thing with the Government map?—I do not think I should make any objection to that. I did this map on my own responsibility, I may say.

3444. (Chairman.) If liberty was given on payment of a royalty to reproduce the Government map on any scale, the Government might be provided with a greater variety of maps, maps with more varying characteristics than they have at present?—That would be the case, and that would be a very desirable result, in my opinion.

3445. Do you know Mr. Bartholomew's maps of Scotland?—I do.

3446. They are reproductions of the Ordnance map on $\frac{1}{2}$ -inch scale?—Yes.

3447. But different in style?—Yes.

3448. You think they meet a public want?—I think they do.

3449. You think it quite legitimate, depending so largely as they do on the Ordnance Survey, that these maps should be published privately without any acknowledgment of the expense to which the country has been put?—Well, I should have to answer that question from two standpoints, one as a British taxpayer, and the other as a geographer, and my answer would have to be different in each aspect.

3450. As a taxpayer you think there should be a restriction, and as a map user you think there should be perfect liberty?—Yes.

3451. (Sir A. Geikie.) There is one question I should like to ask with regard to your reproduction of the Ordnance Survey maps. You are aware, I have no doubt, that this reproduction takes two forms. In the first place some publishers simply photograph the Ordnance Survey maps on a slightly smaller scale; that is more mechanical reproduction, and they publish these at a very small price indeed. The difference of scale is so small that the public may be deceived as to their being exactly facsimiles of the Ordnance Survey; except for this difference of size they are exact facsimiles. That is one kind of reproduction. The other kind of reproduction is that adopted by Mr. Bartholomew, to which the Chairman has referred, where he ejects a great deal of unnecessary topography, engraves the map on copper, and produces a new map, puts his contour lines in and sells that map at nothing like the cheapness of the photographic reproductions, but still cheaper, of course, than the Ordnance Survey. I understand that Mr. Bartholomew considers that he has produced a new map based upon the Ordnance Survey. The other publishers, who simply reproduce their maps by photography, contend that the maps are public property, and that they are at liberty to reproduce them as they choose, and they are

of course very simple mechanical reproductions. What I want to ask you is, is there any difference between these two methods or would you legitimise them both?—I should legitimise them both; but in regard to Bartholomew's map, if you were to apply the principles of a court of law to it, I take it for granted that it would be held to be an infringement of copyright, though you might say with extenuating circumstances, which would not exist in the case of a mere photographic reproduction.

3452. (Chairman.) You suggest that we ought to have a 2-inch map. Why do you suggest that?—Because I think the 1-inch hardly gives a sufficient amount of detail for travelling purposes. You cannot always identify satisfactorily and safely cross-roads and turnings and footpaths.

3453. Do not you think that a 2-inch map would cover too small an area of the county to be useful?—No, I do not think it would.

3454. I mean to be convenient?—No, I do not think so.

3455. (Mr. Mather.) Are you recommending another map still?—No; I am afraid the officials would not agree on the point. What I meant was really an outline with important roads and important cross-roads and footpaths, and watercourses and rivers and things of that sort.

3456. (Chairman.) But you would have as many names as you have on the 1-inch map?—I would not do that.

3457. You would have a larger-scale map with less detail?—With less unimportant detail. I mean detail unimportant to casual travellers.

3458. (Mr. Mather.) Really a map of roads and tracks?—That is more my idea.

3459. (Chairman.) Has your attention been called to the last form which the 1-inch map is taking (*a sheet produced*). That is a temporary sheet produced by photo-zincography and not engraved?—I have not seen this.

3460. You will notice that the parish names are omitted?—Where you are walking across a tract of country it is exceedingly difficult to find your way across tracks which are not well defined when using a map on the scale of 1 inch to the mile, and I think it would be convenient if something could possibly be produced between 1-inch and 6-inch. I have travelled over many miles of down land on the Surrey and North Sussex hills, and I have found a very great difficulty indeed.

3461. Have you tried Salisbury Plain?—Not on foot.

3462. On horseback?—No, I was with a friend on Salisbury Plain who knew it.

3463. (Sir A. Geikie.) Do you think that an outline map on the scale of 2 inches to the mile without much detail would be of general use to the whole public?—That is my impression.

3464. Do not you think it would be more likely to be serviceable simply to pedestrians and tourists. Do you think the general public would find a map on so large a scale without detail of much service?—I am under the impression that they would, and you must consider this: the number of people who move about along the English roads is now enormously greater than it was even ten years ago. I saw it stated the other day that on last Easter Sunday a man counted 1,080 bicycles, &c. passing his house over a part of the road between London and Brighton.

3465. (Chairman.) They would all be on a road, and the 1-inch map would be quite as useful to people on a road as a 2-inch map?—But it does not serve when they want to turn off the road and get across country to another main road.

3466. Supposing you have a 1-inch map hill-shaded, showing, as I think the 1-inch map does, every building, is that not sufficient to enable you to find your way across open country?—I think the hill-shaded 1-inch map would be very useful, but I originally made my remarks without knowing that the shaded new 1-inch was going to be generally published. I know a few maps have been published, but I did not know whether it was going to be carried out all over England.

3467. (Mr. Mather.) Will it meet your objection if the new map is hill-shaded for the whole country?—I

think it would very much modify my objection and give facilities which do not now exist.

3468. (*Chairman.*) Do you think the hill-shading in the neighbourhood of Brighton, probably a country you know well, is satisfactory?—I think so.

3469. (*Lieut.-Gen. Cooke.*) As a matter of fact do not cyclists generally use maps on a very much smaller scale than the 1-inch?—Yes, but I take it that is because they cannot conveniently provide themselves with 1-inch maps.

3470. (*Chairman.*) Are the 1-inch maps too large to carry?—Not too large to carry; too expensive when you are going to cover a large amount of country.

3471. A 2-inch map would be more expensive still?—No; it need not be.

(*A map of Beigate and district was handed to witness.*) May I ask whether this principle of hill-shading is going to be carried out over the whole of England?

3472. (*Mr. Mather.*) That is the intention?—That I was not aware of.

(*Chairman.*) And the hill-shading is to be done by separate plates and will be printed by a second printing.

3473. I put into your hands now two maps, both of which are experimental ("Portsmouth and the Isle of Wight," an engraved map with hills printed in brown, and "Isle of Wight," a photo-zincographed map printed in five colours, hills in black). As maps they are identical in regard to detail; as regards the accessories of decoration or colour they are experiments. Which do you prefer?—I should be inclined, on the score of clearness, to give preference to the black hill-shading.

3474. Can you read the writing as well on the black as you can on the brown?—No.

3475. (*Mr. Mather.*) Will not you include the question of reading the map throughout as well as the clearness in appearance of the whole?—If you take the two questions together the preference must be given to this (Isle of Wight). If you want to get a clear impression of the elevations regardless of names, I think preference must be given to that (Portsmouth and the Isle of Wight).

3476. (*Chairman.*) As a picture that (Isle of Wight) is best; as a map the brown engraved (Portsmouth and the Isle of Wight) is best?—Yes.

3477. (*Mr. Mather.*) Do not you buy these maps as things to guide you?—We do.

3478. Therefore the name and the distinctness of the map as a whole must determine you in giving judgment, must it not, as to the two maps?—Yes, I think so.

3479. Therefore the brown shaded engraved map would have it?—Yes.

3480. (*Chairman.*) That will be an entirely new departure?—In the coloured experimental map of the Isle of Wight you have black hill-shading, green for woods, sienna for roads, red for houses, and blue for water. I do not think there is enough green. Look at the green on my map (Eastbourne District).

3481. (*Sir A. Gielkie.*) Sir John's question was not as regarded the woods, but as to the hill-shading and the general appearance, the roads being in brown?—Yes, I like that photo-zincographed map (Isle of Wight) certainly, with the qualification that I think the green ought to be more defined.

3482. (*Chairman.*) To your eye is the map (of Eastbourne District) that you have coloured and published more satisfactory than that map (Isle of Wight)?—It is. I did that myself. I thought carefully over it, and the conclusion at which I deliberately arrived was that where you had a wood, which was what I may call a solid wood, it should be indicated by a solid mass of green.

3483. (*Mr. Mather.*) Taking the coloured experimental photo-zincographed map of the Isle of Wight as a whole, would you consider that a good form or style of execution for the whole country?—I think that as regards the execution it might be better. The brown lines of the roads do not strike me as being so sharp as on many of those German maps.

3484. All the colouring is too feeble on that map, in your opinion?—I think the colouring is too feeble. I like the idea, however, of the map.

3485. (*Sir A. Gielkie.*) The main point in the map is the combination of contour lines and hill-shading. That

is really the important point of the map. Can you express any opinion as to the relative value of the map for your purposes when it has simply hill-shading as compared with hill-shading and contour lines, or with simple contour lines?—The contour lines I can interpret myself, because I have a little engineering experience and knowledge, but I do not think the contours are generally useful or acceptable to the public at large, and I think the public at large would give the preference as between one and the other to the black hill-shading. Whether the public would appreciate this intermediate scheme is a thing which can only be arrived at by experience.

3486. (*Chairman.*) We wanted to get what you yourself would approve of. As a tourist, which map would you yourself buy?—I think as a tourist I should buy the brown engraved map (Portsmouth and the Isle of Wight). But I should be rather taken with the idea of the roads being of a different colour, as in the coloured photo-zincographed map of the Isle of Wight. I think as this map is presented to me now, if I may venture to say so, it is not exactly one thing or the other, and is not definite enough.

3487. I put in your hand the French *carte vicinale*?—I must say I prefer the French *carte vicinale*. I think these two sheets meet what I think is the drawback in the coloured experimental map of the Isle of Wight.

3488. You would say that the colours of the Isle of Wight photo-zincographed map are a little too vague?—Yes; the *carte vicinale* is more definite.

3489. (*Chairman.*) You would prefer a map in the style of the *carte vicinale* to our Ordnance map?—Yes.

3490. Hill-shaded?—Yes. For the 1-inch I think it is very advantageous to have the extra colouring.

3491. (*Mr. Mather.*) You observe there is shading here, but it is not so perfectly done as in our Ordnance map?—On the other hand, the *carte vicinale* has the advantage of exhibiting at a glance the contrast of features. You know that coming along that road you will have a wood on your left; there is no doubt about it. But I think coming along one of these roads (referring to the photo-zincographed map of the Isle of Wight) you would have to look into it carefully. Do you appreciate what I mean? Taking the *carte vicinale* as a whole, and putting it into the hands of a traveller, it strikes you as indicating to him at once the general features of the country he is going through.

3492. (*Chairman.*) You think that the treatment of our map is somewhat too delicate?—Yes.

3493. You like coarser treatment?—Not coarser; deeper.

3494. (*Mr. Mather.*) A more graphic treatment?—A more graphic treatment.

3495. (*Mr. Roby.*) Do you think the style of denoting hills in the *carte vicinale* is as effective as the regular hill-shading?—No; I said a few minutes ago that I thought as regarded the more contrast between hills and low-lying ground, that the contrast, whatever it might be, was best brought out by the ordinary black and white, but when I said that I was stopped by the suggestion, true enough no doubt, that the contrast so arrived at interfered with the legibility of the names.

3496. Have you a 10-foot map of Eastbourne?—I think we have; I am speaking now in another capacity, as a member of the town council of the borough of Eastbourne for many years past.

3497. Do you know when it was surveyed?—In 1870, I think, but I am not sure.

3498. Do you think it would be practicable for your borough surveyor to send to Southampton every year a tracing, on the 10-foot scale of his own map, of all the alterations to buildings which have been supplied to him by builders and architects in executing works?—Yes, that would be perfectly practicable.

3499. Upon that it is suggested that an examiner should be sent from Southampton to test the drawing of those alterations, and if found satisfactory they would be put upon the map. Would such a scheme as that work, do you think?—Yes, our surveyor is expected as a matter of bounden duty to place upon that map every new house so soon as the plans for building: hat house are passed, and also to place on that map the new roads as they are laid out according as the plans are passed.

3500. So that your surveyor would have no difficulty in giving to the department at Southampton drawings

Mr. G. F.
Chambers.

2 June 1892.

Mr. G. F.
Chambers.

showing all the alterations in the town?—No difficulty whatever.

2 June 1892.

3501. In that manner the revision might easily be carried out subject to examination by the Ordnance Survey?—Yes.

3502. (Mr. Mather.) Coming back to what has been touched upon in an earlier part of your evidence, do you see any objection to the Ordnance Survey Department being solely a map-producing department for the purpose of maintaining standards for the accuracy and styles of maps, and then leaving it to the public to produce any maps they like in any colour or in any form for the purpose of supplying information to every class of the community?—Well, I see no objection to the Ordnance Survey Department doing more than that question seems to contemplate, and I see no objection to a Government department being publishers.

3503. Yes, publishers in one form, but not in every variety such as you seem to indicate the public require?—I do not see any objection myself to the Ordnance Survey Department publishing these maps in different forms, coloured, for instance, as the one we have just been looking at.

3504. Perhaps you have not considered that the chief objection is, they cannot publish these maps at the same price as the general map-maker, who has to gain a livelihood by his profession?—Is that so. Do you mean to say that the private publisher can produce chromo-lithographs cheaper?

3505. Yes, because the maps not being for State purposes he produces them on inferior paper, at least on paper which is less costly, and in a form that satisfies the public very well, but which the Ordnance Department itself has not thought fit to adopt?—Well, of course, if that is so, that is a question which is regulated by the law of supply and demand I suppose; but I see no objection myself to the Ordnance Survey Department condescending, if I may use the expression, to cater for the demands of a public who want a cheaper specimen of map.

3506. That is the whole point. Would it not be better done by the general map publishers of the country using the data and information and standard maps of the Department for the ground work upon which to work?—No; I am not sure about that at all. I do not see why the Ordnance Survey Department, if there is a demand on the part of the public for a cheaper sort of coloured map, should not step into the market and supply that map.

3507. (Lieut.-Gen. Cooke.) Do not you think something is due to private publishers, and that the Government should not take all the work out of their hands, many of them having already gone to a good deal of expense in publishing modified plans of the Ordnance Survey, such as the 4-mile maps they have published, and which are very good, I believe. Do not you think the trade of the private publisher should not be interfered with. If the Ordnance Survey Department produces a perfect map of the country, should not all the rest be left to private enterprise?—I am not sure about that. If the Ordnance Survey as a State Department can produce a perfect map of the country, surely, in the interests of the taxpayer they are entitled to turn their knowledge and appliances to use in making a profit out of what they are able to produce.

3508. But I do not think the taxpayer would benefit?—Yes, if the maps of the Ordnance Department are popularised by some special arrangement and a large demand sets in for them, I take it that reduces the burden of charge on the Treasury for the Ordnance Survey Department as a department.

3509. I think you will find that they are sold at very little more than the cost of production?—Supposing it were to be assumed as the policy of the Department that in order to meet a popular want it was necessary to supply a series of maps of a cheaper character—an inferior character in one sense—to meet the popular demand, it seems to me that the Department could do them much better and in the long run much cheaper than any private publishers.

3510. (Mr. Mather.) Have you considered that the present map-makers of the country, Mr. Bartholomew, for instance, and others have laid themselves out to produce a certain class of map, and they base their claims for business upon the quality of this particular class of map, and those who desire such a map go to

them for it; other map-makers take another line and produce other maps, and by this private enterprise on the part of map publishers, capital is embarked in the production and distribution of maps all based upon the correct Ordnance Survey, which the country pays for. If the Ordnance Survey Department had to consider public taste and public requirements, they would have to possess as much enterprise as all these respective map-makers put together, which from a Government Department is absolutely impossible under any circumstances?—I see what you mean, but I would say that these private map publishers entered upon their business with a knowledge that they would have to be in competition with Southampton.

3511. I was asking, would it not be better for the public, if there was not this competition, that the origin of information should be a State department and that the distribution of that information in the form of popular maps of every variety, such as you yourself have had to make for your own convenience, should be in the hands of private enterprise, the Department encouraging such private enterprise and making it as easy as possible for them to make use of the information they possess and give it to the public?—No, I do not think I quite agree with you there. I feel perfectly certain that the Ordnance Survey Department could have produced my map of the district round Eastbourne in a better style, better in all particulars, and at a cheaper price than I did it.

3512. They could not possibly do it?—Is that really so?

3513. They would have such an infinite variety of work on hand, so many styles of map to produce, they would have to become great manufacturers of maps for the entire country. They are not that; they have been instituted as a State department for the production of a survey of the whole country for the purpose of supplying information, civil, military, and commercial?—Of course you must draw the line somewhere, no doubt.

3514. The private publishers, you see, do not draw the line anywhere; they watch the public itself. For instance, you have indicated that recently since cyclists came into existence a different kind of map is needed to suit their particular requirements. The State department will not consider what is a good map for cyclists; they have the information which a map-maker can use for the purposes of cyclists, but the enterprise of the private map-maker must be used to determine in what form cyclists would like to have it?—That is true, but the enterprise of the private publisher would not cease, supposing the Ordnance Department did a little more than it does in the way of catering for the public by coloured maps.

3515. One object of our investigation is to elicit knowledge on this question, whether the Department is not doing too much already and ought not to leave to private enterprise the multifarious forms in which these maps should be produced originating upon the basis established by the Ordnance Survey Department?—If you put it to me as a question whether the Department is not already doing too much I would say emphatically it is not doing too much; it is not unduly trenching.

3516. It is not a question of trenching: these other interests are not in existence yet. I want to know whether it is not a good thing to create those interests, to create private enterprise, amongst map-makers, so that the public may have the knowledge of the Ordnance Survey Department disseminated more quickly than it does now?—I should be more satisfied with the finished result if that finished result proceeded even more from Southampton than it does now.

3517. It is impossible without doubling or trebling the Department, and our reference is to find out how with our present resources and our present means we can expedite the work in such a way that we can get a revision of the whole country, which has not been commenced and of the want of which you have complained this morning. Finally, I should like to get to know from you from your experience, which appears to have been a very large and valuable experience, whether the private map-makers of the country, such as Mr. Bartholomew and others, would not be able to supply the public demand if the Ordnance Survey Department kept up all the information necessary for them to base their maps upon?—To some extent the private publishers no doubt could do it, and any arrangements which could be carried out for keeping the Ordnance

maps a little more up to date would no doubt be extremely advantageous to the public, but if you say that keeping the thing up to date is as much as the

Department can do, I bow to your statement of their powers.

The witness withdrew.

Mr. ELLIOTT COOPER called and examined.

3518. (*Chairman.*) You are the engineer of the Lancashire, Derbyshire, and East Coast Railway?—Yes.

3519. That line was sanctioned by Parliament last year?—Yes.

3520. And was one of the longest lines ever sanctioned?—The longest ever sanctioned in one session.

3521. And you have used the Ordnance maps in laying out that line?—That is so.

3522. In consequence of that being the longest line passed in any Session of Parliament your experience ranges over a wide extent of country?—Very. I may say that I prepared large numbers of preliminary projects for lines through Yorkshire 25 years ago, so that I have an intimate knowledge of the different Ordnance surveys extending over certainly 25 years.

3523. With regard to the three scales, the 25-inch, the 6-inch, and the 1-inch, how do you use each of those respective scales?—The first thing we do is to lay down the project generally on the 1-inch scale. By that means we see the relative positions of the various towns and villages, and the positions of the rivers, and by the shading of the 1-inch (I am speaking now of the time before the 1-inch map was contoured) you see generally in what position the line must go so far as the valleys and hills are concerned.

3524. On this line were you able to use the new 1-inch, or had you to use the old one?—I had the new 1-inch map through Derbyshire. I think I got it direct from Southampton.

3525. (*Mr. Roby.*) The new 1-inch has not the hill-shading, has it?—Yes, the new 1-inch map has the hills partially shaded.

3526. In Derbyshire?—I have one here, but when we have the contours of course the shading is immaterial; but without the contours, and without the shading, the 1-inch map, except for finding your way through the country when a line had been defined, would not be of any very great practical use.

3527. (*Chairman.*) The old 1-inch map had no contours on it, it had hill-shading. The new 1-inch map which you were using had the contours on it?—Yes.

3528. And you found those contours of great advantage?—Very great indeed.

3529. That map is contoured to every 100 feet?—Yes.

3530. (*Mr. Mather.*) Is the contouring more serviceable than the hill-shading for your purpose?—Yes, when we are accustomed to it. The way we do is this: we colour the contours with a thin line in different colours. The result is that the eye tells you at once the various inequalities of the ground, and shows you the valleys by means of these lines, so that when once you get accustomed to it it gives you just the same knowledge as the shading gives you.

3531. To you as a civil engineer is not the contouring which you yourself fill in afterwards with a little colour to attract the eye more serviceable for laying out your line than the hill-shading, however carefully it may have been done?—Very much more.

3532. (*Chairman.*) In colouring your contours do you run lines of different colours along the contours or do you do it after what I may call Mr. Bartholomew's style?—We do both as a matter of convenience; it just depends. When the contours are very close together then we colour in one colour all the ground that is within the contour, that is to say, if there is a contour of, say, 200 feet, and the next contour is 300 feet, we should colour in one colour the ground lying between the 200 feet and the 300 feet; but where the contours are some distance apart, that is, in not very hilly country, then we merely colour the contour itself, just putting a line of colour round the actual contour, so that the eye can follow the contour at a glance. I could show you on the 6-inch map how it is done; I have the original map that I used.

3533. (*Mr. Roby.*) Do you do the same with the 1-inch?—We do the same in each case.

3534. (*Chairman.*) After you have laid out your plan on the 1-inch, you then take the 6-inch scale?—Yes.

3535. What use do you make of that?—The first thing we do, having got a general idea of the direction of the railway, is to decide what gradient can be adopted to get for instance over the Peak of Derbyshire. There are certain levels from Chesterfield to Buxton, two of our principal places; the point is how are we going to get between those two places and with what gradient. Having settled in our mind what we think is the best gradient we can get, we take a pair of compasses (and this is where the contouring comes in so useful) and if we say 1 in 50 that would of course practically be 100 in 5,000; we step our compasses round, following the contours, and seeing at what point we begin to get underground, so if we find our gradient of 1 in 50 is lifting us too high, if when we have stepped 4 or 5 miles we find we are 100 feet above the surface, we then try some other route to see if that is only a local difference, and then if we find we can get a better gradient we alter our compasses so as to get a flatter gradient, and so work up. Having by that means stepped out approximate points through which points we must pass to keep the railway as nearly on the surface as possible we then draw a line on the map, and from the contours we plot an actual section, and when that is carefully done you could scarcely tell they had not been actually levelled with a level.

3536. All that is done in your office?—Entirely.

3537. How far do you trust to that before you go on to the ground?—We trust to that absolutely before going on to the ground. Our experience of the 6-inch Ordnance map is that it is so absolutely correct that you are perfectly certain of arriving on the ground at the result you have come to on the map, so far as actual facts are concerned; that is to say, if you work up a gradient on the Ordnance map and you find you are 20 feet above a road at a certain point you will not be more than a foot or two out if you level it with your level.

3538. (*Mr. Roby.*) Are you speaking now of the preparation of the plans or the execution of the work?—The preparation of the plans. I am speaking now of the preliminary preparation of the plans before any exact route has been defined to submit to Parliament.

3539. (*Mr. Mather.*) You say in executing your work upon such a plan you would not find yourself out more than a foot or so?—No, I am speaking now of the preparing of the plans. Of course the execution of the work would necessarily come out according to the level of the plans.

3540. The levels you yourself take on the spot?—Exactly.

3541. But I understand you to say, speaking of the accuracy of this Ordnance survey, that when you have tested it by the practical survey by which you actually construct your line you have found it very near indeed?—So near that we may call it perfect.

3542. (*Chairman.*) In passing through the country you are in part using the old 6-inch map which was contoured to 25 feet and partly the new map which is contoured to 100 feet. Did you find there was any serious inconvenience in the new map not being so closely contoured as the old map?—Yes, I think that the change in the contouring from 25 feet to 100 feet is a very great mistake, because it is manifest that between two levels of 100 feet there may be very many equalities, but between two levels of 25 feet the chances are very much reduced.

3543. In practice you find that occur?—Very much so; for instance, in going across a piece of country, we will say up a valley, if you are only contoured every 100 feet there may be a ravine 50 feet deep in between the contours which is not shown at all, whereas with 25 feet contours it must be something under 25 feet that you miss.

3544. (*Mr. Roby.*) That is not important?—No, because you know by the way in which the contours

Mr. G. F. Chambers.

2 June 1892.

Mr. E. Cooper

Mr. E.
Cooper.

2 June 1892.

run that there is a depression or an elevation between; you can get it to 5 feet or 7 feet with a 25-feet contour.

3545. (*Chairman.*) You have said that all this work has been done in your office without survey on the ground?—The preliminary work.

3546. Can you give the Committee any idea of how much cost was saved by your having the assistance of these maps?—Well, I could not say that. In my opinion, it would never have been done without the maps. It is quite impossible to say what the cost would have been, because it would have meant running an infinite number of levels to arrive at a conclusion which you get from the Ordnance maps in an hour.

3547. That was the course adopted with all the earlier railways of England necessarily?—No, I think not, because all the earlier railways were made, or very largely made, after the first Ordnance maps were prepared. The first Ordnance maps were prepared in about the year 1856, I think.

3548. If you take the Great Western Railway, which is a very long railway, that must have been entirely laid out without the assistance of any Ordnance map except the 1-inch uncoloured?—Yes, but of course the Great Western following to a great extent the Thames Valley in its original form was not a very difficult thing to arrive at.

3549. Take the London and Brighton; there was no contoured map there?—That I cannot say; I do not know.

3550. I was trying to draw a distinction between the making of early railways and the making of railways now. What are the greater facilities for making railways which the new map affords as compared with what were afforded when you only had the old 1-inch map which was uncoloured and which was hill-shaded. That map existed nearly everywhere. That 1-inch map was the only facility that railway engineers had?—Yes.

3551. Was that map anything like as serviceable as the present 6-inch and 1-inch maps which are contoured?—No.

3552. Could you give the Committee any idea how much saving there might be per mile in making a preliminary scheme for a railway at the present time over what existed formerly?—I can give it to you in this way: I am the engineer for some of the South African Railways where of course there are no maps at all, and where everything has to be done as it would have had to be done in this country originally without a map, only of course in that country it is nothing like so rough except in one or two points. The cost of the surveys in that country run to as much as 100% a mile. The preliminary survey with the use of maps in this country is considered amply paid at 20% a mile.

3553. (*Mr. Mather.*) At present?—At present, but that is for an ordinary country such as Surrey; but if you took a map of Derbyshire or a map of North Yorkshire the difference is enormous, because that country is so exceedingly rough, and there are such a great number of valleys leading to certain points, anyone of which you think you may use, all of which would have to be separately surveyed before you could arrive at a conclusion as to which was the best. The result is that in a country like that it is quite a different thing to laying out railways as they were in the old days, when easy routes were taken. All the easy routes have been filled up, and now railways have to be made where 40 years ago no one would have dreamed of making a railway, for instance, from Macclesfield to Chesterfield.

3554. (*Mr. Roby.*) I suppose that hill-shaded map of Surrey would enable you to form a very good idea where to take your line?—Yes very good indeed. Surrey is about the worst example you could give to show where the defects and the advantages are, because the hills are so defined, the country is so open, and the villages are all so plain; they are so far apart there is no difficulty in finding your way, so you are not confused on a map like this; but if you take a map of Cumberland it looks quite a different map to this. I have brought one with me to show.

3555. (*Chairman.*) Would it be far wrong to say that three-fourths of the expense was saved by having the advantage of these maps?—Certainly not; you are very well within the mark.

3556. You have said the Ordnance maps are very accurate and very good; are there any faults that you find with the maps that you would like to mention?—The faults are chiefly want of uniformity. The maps, for instance, that join up one to another are printed very often on different kinds of paper.

3557. We are dealing with the 6-inch now?—I am dealing with the 6-inch. The only fault of the 1-inch map is that where the hills are very defined the shading is too heavy. There is too much attempt to make it a picture.

3558. Or the new 1-inch map?—I am speaking of the shaded 1-inch map, the old 1-inch, but I did not know you were abandoning this; if it is proposed to abandon the shaded 1-inch map altogether, then of course my remarks would not apply.

3559. (*Chairman.*) We will confine ourselves as far as possible to the new style, what is now being done. I will draw your attention to the map of East Kent. That is a specimen of the 1-inch engraved hill-shaded map. There is no practical difference between the style of the hills there and in the old map?—No.

3560. Do you think the shading is too dark?—No, not on that map.

3561. Would it remove your objections if the hills were printed in brown (*handing witness engraved map of Portsmouth and the Isle of Wight*)?—The only objection I have to this is that the brown is carried too far into the valleys. It gives it too brown a tint all over. For instance, all along there is a brown tint throughout; the only part of that map that does not look brown is the foreshore; that part (*indicating*) looks as if it had been washed with brown.

3562. But you will notice that the hill-shading, if printed in black, does run as far as the brown colour goes; I refer to the minor hills?—To show the minor hills is really a mistake. You cannot show the minor hills, and they do not really convey anything to the mind. I have seen hills shaded, mere undulations of the ground.

3563. (*Mr. Mather.*) That is probably the case there?—I think that is so; the result gives a general brown tone to the map.

3564. (*Chairman.*) Would you look at a black impression and see if that gives you the same impression (*referring to map of East Kent*)?—Not to the same extent; the shading is much sharper. I am also the engineer of the Isle of Wight railways, and I have a Bill in Parliament this session for a new line to Ventnor, so that I know the country and the hills perfectly, but any one not knowing the Isle of Wight would obtain from this map (*Portsmouth and the Isle of Wight*) the faintest impression of the contour of the country. The big hills are not shown, in my opinion, sufficiently distinct from little hills. There is too much attempt to show more than a map of this scale can possibly show. (*A coloured photo-zincographed map of the Isle of Wight was handed to witness.*)

3565. (*Mr. Mather.*) Does that convey an idea to you of the topography of the island?—No, I am trying to find a hill that I tunnel through, but I cannot.

3566. (*Mr. Roby.*) Can you find it there (*handing witness the engraved map with hills in black*)?—Yes, we tunnel through here. This is a road up there; we tunnel through this hill there. There is a hill of 400 feet which we tunnel through. Then of course there is this tunnel. I do not know whether that is shown on the coloured map. The coloured map is contoured as well, but that hill you see is not shaded at all. You would not know that that was a high piece of ground.

3567. You are an engineer accustomed to use contours, and you think that you do not get the same impression from the contours as you would from hill-shading?—Not seen from a distance. By colouring round the contours I create a shading for myself.

3568. (*Chairman.*) Now we will pass on to the 6-inch maps. You say that in the 6-inch maps there is a want of uniformity?—In dividing them up into small quarterly divisions we find they are inconvenient, because for no purpose that ever I have known did we ever want one sheet, and therefore it always means mounting them, and the paper in many cases being different it is very difficult to join them together. The uniformity I speak of more particularly is that they should be contoured uniformly.

3569. Are they not contoured uniformly?—Some are 100 feet.

Mr. E.
Cooper.

2 June 1892.

3570. That is Lancashire and Yorkshire you are speaking of?—Yes, throughout the country there ought to be uniformity in the contours, uniformity in size, and there ought to be uniformity of paper.

3571. (Mr. Roby.) And the larger the size the better for your purpose?—Very much.

3572. The whole sheets are better than the quarters?—Far better. And another innovation of late years which I think is a mistake is dividing the sheets of the counties. I cannot see what reason there is for finishing a sheet up to a county boundary only.

3573. (Chairman.) That is abandoned now. Every sheet is completed?—I had to use some last year, and I could show you one that I have had to mount.

3574. We have understood that every sheet now is filled up?—Then that objection is done away with. I refer to Derbyshire and Cumberland; I think I have one in Cumberland.

3575. (The Secretary.) The adjoining counties are Yorkshire and Lancashire and in both cases the new survey is not yet complete, therefore the data for filling up these particular sheets do not exist?—That takes away my objection of course.

3576. (Chairman.) In passing from east to west have you found inconvenience from the different meridians on which the maps are surveyed?—No, I cannot say that I have.

3577. And you have passed right across England from east to west?—Yes.

3578. And you have not been inconvenienced?—It necessarily must have been so, for we have never found a practical difficulty.

3579. You think the objection that has been raised upon that point is not a substantial one?—No, I do not think it is a substantial one.

3580. Has your attention been called to Mr. Crook's objection. Mr. Crook mentioned this subject at the British Association and also in a letter to the "Times," and he has been a witness here, and he laid considerable stress upon the difficulty arising from different meridians having been adopted, the districts having such different meridians being bounded by irregular county boundaries and not by N. and S. sheet-lines. You could not cross England without noticing that difficulty if it existed?—Oh, yes; in fact it never even so much as occurred to me; I have had the whole of the line laid down on the 6-inch Ordnance, and now that I am surveying it on a scale of 2 chains to 1 inch, no one has even suggested a difficulty. The surveyors have never suggested any difficulty, and in fact a line laid down on the 6-inch map is now being re-surveyed on a scale of 2 chains to 1 inch for practical construction.

3581. What have you to say with regard to the want of uniformity in the paper?—Some is white, some yellow, some is soft, some hard; the result is that some shrinks more than others, and in some cases you get as much as 4 or 5 chains out in the width of the sheet.

3582. Do the white paper sheets vary?—The white varies more than that which is slightly yellow tinted.

3583. The yellow tinted differs a good deal from the white, does it not?—Yes.

3584. Does the white vary amongst its own sheets?—I cannot say I have made special notes of them. I cannot say that I have noticed that, but I know you rarely get three or four or five or six sheets which are not of different texture.

3585. Is the paper in point of substance such as you desire to use?—Not if it could be avoided. The best substance was that which the maps were printed on 25 years ago, the yellow sheets. It was a much harder paper. (Specimens of the old yellow, the old white and the new white papers were handed to the witness.) The new white is better. The old white, I suppose we should say, is a paper you cannot rub out on. When you come to rub out on this you are apt to take the surface off. Now that never occurred with the old yellow paper, but the explanation given to me of that was this: that with the old yellow paper the printing was from steel plates, and of course you could use a much harder paper whereas the maps being now printed by lithography of course you want a softer paper to take the impressions. I do not know whether that explanation is correct.

3586. (Mr. Mather.) The ink is almost in relief on the later productions and therefore when you come to

use your rubber the lines are rubbed away?—If the paper were not fairly soft it would not take the impressions.

3587. (Chairman.) You would not like a thin paper like Evans's thin paper?—No, for practical purposes you would have to have every sheet mounted on linen.

3588. (Mr. Roby.) And you use them unmounted?—Yes, we mount them if they are likely to have much heavy wear.

3589. You want a stout kind of drawing paper?—Yes, a hard drawing paper.

3590. (Chairman.) Have you any sheets here of paper you object to or approve of; Major Johnston thinks that the yellow paper is not a hard paper. You say it is a hard paper?—I could not tell. I do not know whether I could tell straight off. I am speaking of the paper that was in use from 15 to 20 years ago for those printed before this new process was adopted. Whatever paper that was, that was the best paper.

3591. (The Secretary.) That is a different paper from this. It was used for the engraved 6-inch maps. (Chairman.) The present paper is too soft; you cannot work upon it?—We can work upon it, but if we work very much upon it and have to rub, we are apt to efface the lines. (A map of Hampshire was handed to the witness.) This is the texture of the old paper and that is the paper I like; it is a beautiful paper.

3592. Do you consider there are too many details on the 6-inch sheets?—The details are only those that have been put in by the ideas of the draftsmen to a certain extent—I mean if you take many of the 6-inch Ordnance sheets which have been surveyed wide apart you will find that some have a great deal more detail in the shape of ornament than others. What we prefer is that nothing shall be shown that does not show actual fact; that is to say, trees in hedgerows are very often sketched in, and if they are at all numerous you are apt to get confused. If when you have laid out a line you see your line going on the left of a tree and it is shown on the map on the right of a tree, although it is nothing of itself it is apt to make you think that you are wrong, but the surveyor, seeing half-a-dozen trees in a hedge, put them in and naturally did not survey each individual tree. Then these are details I should prefer not having in at all.

3593. You would put in actual trees?—Isolated trees I should if they were so isolated as to be unmistakable marks. You very often find in a park one big oak. That should be surveyed and put in. It would be a very useful thing indeed to put in, but I do not think anything should be put in that has not been actually surveyed.

3594. How would you limit the surveyors as to the number of trees they should put in?—You say you would put in a conspicuous tree like an aged oak, but, of course, in a park there are many isolated trees of all ages. Would you tell the surveyor to put in all those isolated trees of all ages or would you try to restrict him to such trees as in his opinion were conspicuous trees?—Yes, I should; I should leave it to his judgment of what would make the plan one that you could comprehend when you looked at the ground and that you could not mistake where you were.

3595. In addition to that you would also represent clumps by conventional trees?—Yes, exactly.

3596. In doing that should you suggest that a different stamp should be used for surveyed trees, different from the stamp used to express conventional trees or wooded ground?—I think it would be a very excellent thing if it could be done. (Sheet 33, Gloucestershire, was handed to the witness.) There are two trees which I presume have been surveyed, because they are two separate trees and they form land-marks; but these trees in that hedgerow I should not put in because it is a thousand to one they were never surveyed, and there may be that number of trees or there may be more or less.

3597. You would not indicate that it is a hedgerow with trees?—No, because they are continually being cut down, and probably before the map could be printed some of these trees would have gone.

3598. (Lieut.-Gen. Cooke.) We will take an intermediate case—what should you do there?—I should not show those trees at all as a mere hedgerow. When you have a hedge you have sufficient to identify it; you have got your garden, so you do not want those two trees.

Mr. E.
Cooper.

2 June 1892.

3599. (*Mr. Mather.*) Here is another instance where the trees are near a fence. Would you put in one or two of the large trees and leave the others out?—If there is a clump in that form in the middle of a field I should put them in.

3600. (*Chairman.*) I have no doubt those trees are all surveyed trees?—The only object of course is to identify the ground. If you have the fence it is sufficient identification. The trees only more or less hide the fence.

3601. And you would like that those trees which are surveyed trees should be shown differently from the trees along there in a coppice?—Yes.

3602. (*Lieut.-Gen. Cooke.*) Then the question is to define exactly what you would survey?—I should leave that to the surveyor.

3603. The Ordnance surveyors are a very large number, and of course there are good and bad, and it is very necessary to lay down some definite line which will be intelligible to all. (*The Secretary.*) I may explain that the rule of the Ordnance Survey is that hedgerow and other single trees are put in in position, but all trees are not put in, that is to say, if the trees are too close together they omit those that there is no room to show, but any trees that are shown are put in position?—I should say that was kind of half-surveyed, and the trees are sketched in their approximate positions.

3604. (*Chairman.*) Take that hedge there. I imagine it cannot be suggested that that is the actual number of trees in that hedge. (*Lieut.-Gen. Cooke.*) Some of them would be surveyed accurately, the ends of the row are correctly placed, and then the others would be filled in probably as near as they would go?—The tendency is now to cut down all trees in hedges. Throughout the country that is being done. The result is that when you show a fence with a row of trees in it you think it cannot be the fence because you cannot find a tree.

3605. Do not you think that showing the trees very much confuses the detail especially when you get to villages?—Yes; that is the case.

3606. And then you see it would be necessary to have a very definite rule, because you could not put a few trees here, and leave them out there, or it would give a bad impression of the country?—It would.

3607. It would seem to show that there were trees in one part and not in another, which would not be the case. Therefore it seems to me that there is no alternative but to come to a definite rule to show woods where they amount to woods, and orchards, and to show only distinctly isolated trees in hedgerows, and to omit everything else. I see no alternative?—No intermediate course.

3608. (*Mr. Mather.*) So that the hedgerows would go altogether?—That is what we would prefer.

3609. (*Lieut.-Gen. Cooke.*) Have you found considerable confusion in a case where the hedge and boundary are close together, and three or four trees have to be lumped in with them?—What we do, having definitely settled a piece of country, before we prepare the plans that we deposit in Parliament, is to mount these sheets, and we then scratch out all the trees and objects which are immaterial. We have to do that before we can trace the plan, otherwise it becomes so confused. Of course some parts are clearer than others, but very often it is very confusing.

3610. Then that is the result you arrive at; you would put in woods, forests, orchards, and isolated detached trees not in hedgerows; nothing else?—Nothing else.

3611. (*Chairman.*) You have objected to the sheets not being so large as they used to be?—Dividing them into four parts.

3612 I understand the reason is (Major Johnston will correct me if I am wrong) that four of the 25-inch sheets are as large an object as you can put before the lens for reduction, and that produces the present quarter sheet. Before photography was used there was no such limitation, and the large-sized sheet was then used?—That is practically so.

3613. (*Mr. Mather.*) Would there be a demand for the large sheets for engineering purposes?—I should think also for general purposes. For instance, when I go away for a holiday anywhere to any part of the country, nothing to do with engineering, I always take maps for

somewhere about 10 or 15 miles round where I am going to stay, and I mount the sheets for that district.

3614. (*Chairman.*) From the 6-inch map?—From the 6-inch map—for the purpose of wandering about and amusing myself and being independent of asking any question, but you see this quarter-sheet only represents 2 miles in one direction and 2 in the other.

3615. When it was first begun the lenses were not capable of covering quite so much ground as they are now. It is possible that a lens might now be got which would cover a sufficient surface?—Of course all this is a minor objection.

3616. (*Mr. Eoby.*) If the paper were pretty uniform there would be no practical difficulty in mounting them?—No, the difficulty is in the stretching of the paper.

3617. (*Chairman.*) Those quarter-sheets take four 25-inch sheets, and you would like on the edges a line showing where the 25-inch map divides, so that you might draw your pencil line and use your map as an index, I suppose?—Yes, in fact we have to do that from the index. The index gives you the divisions and then we have to divide up these with red lines in order to see exactly what work comes on a particular sheet. You see that is the only way of knowing. Supposing we want the 25-inch to include a particular village, we can only tell by dividing the sheet up whether that village will come on one particular 25-inch sheet or on another, and if it were practicable to put a line through with the number of the corresponding 25-inch sheet it would be a very great convenience.

3618. You would like the line of the 25-inch sheet to be shown on the margin of the 6-inch sheet?—Yes. Of course the large sheets would divide into 16 in the same way that each set divides into four; it is exactly the same.

3619. As regards the 25-inch map, I see from these notes of yours that you think there is too much detail in them?—In such things as gardens.

3620. (*Lieut.-Gen. Cooke.*) What do you use the 25-inch scale maps for?—The 25-inch maps are used for what we call enlargements. Wherever we include buildings for Parliamentary purposes we have to show all the buildings on a certain scale.

3621. What scale?—You can have it a little less than 25 inches. The 25-inch is about 3 chains to an inch. Parliament will allow us to go as low as 4 chains to an inch, but we naturally use the 25-inch scale although it is a little larger.

3622. That is sufficient scale; that is what I want to know?—Yes, it is sufficient.

3623. (*Chairman.*) That is the only way you use the 25-inch?—That is for Parliamentary work, but then we use the 25-inch for the surveying work afterwards, and a great many engineers use it for actual construction. For instance, the new railway to London is being constructed upon the 25-inch scale.

3624. (*Lieut.-Gen. Cooke.*) Do you mean that the measurements of the ground for laying out the line are taken from the 25 inch?—We survey the line to check the position of the fences, and then the actual tracings are made from the 25-inch and lithographed, and that forms the working plan. I am doing the same thing now in a railway in the Isle of Wight. I have had the line staked out from the 25-inch, and the land is being all bought from it.

3625. Then in fact you have had to make no survey whatever?—Except that we survey to check the 25-inch.

3626. (*Chairman.*) Have you found any errors in the 25-inch?—Not to any practical extent; occasionally, but very slight. One or two points have been mentioned to me, but they have been very small.

3627. The corner of a fence half a chain out?—Yes; occasionally in one or two cases the fences have been omitted; but that of course we could easily rectify.

3628. Perhaps they were new fences?—There were one or two omissions of fences in the Isle of Wight.

3629. (*Lieut.-Gen. Cooke.*) But not many out of the large number of plans you have used?—No; I consider their correctness is wonderful. Then as to the use of the 25-inch plan of course its great use is for residential purposes by people in dealing with their estates. For instance, the late Duke of Portland had the whole of his Scotch estates on the 25-inch scale checked and redrawn

Mr. E.
Cooper.

2 June 1892.

and his estate plans were made from it, otherwise it would have cost him thousands of pounds.

3630. (*Chairman.*) I see you say here you think there is too much detail in gardens and yards and things of that kind?—For instance on the 25-inch they will show a track across a stable yard. If one part of it is paved, and another part is not, they will show the edge of the paving.

3631. And that would add considerably to the cost of the revision of those plans, because all those little details have to be revised too?—Yes; that is a very great practical difficulty where you get all the garden walks shown. For instance, take an allotment where you have every one of the little footpaths shown, you have to revise all those, and if several were altered it would be a very costly thing.

3632. Can you suggest any mode of facilitating the revision of the map by making use of local agencies?—Well, I think Parliament ought to make it a law that the county councils should keep all public alterations, and they ought to require all surveyors to send in all alterations made within their districts.

3633. That could not be applied to private works?—I do not see why it should not.

3634. On whom would you make it obligatory?—In the same way that if you make an alteration in a house in London you have to supply the vestry with a copy of what you have done. I do not see why a landowner if he takes out a fence should not be obliged to supply the Ordnance Department with a tracing of what he has done.

3635. Under a penalty?—Under a penalty.

3636. Do you think it would be practicable to enforce it?—Just as practicable as if a man builds a pigsty in a country village he has to send it to the vestry.

3637. I mean as a question of knowledge. Nobody would know anything about a landowner taking out a fence. What person would be aware of the fact of a fence having been taken out. Would you make it a police offence?—I could not go quite so far as to say what machinery I would suggest for arriving at it. I think you would get a very large amount of information if such a thing were made part of the law of the land. There is no doubt that a certain number of people would evade it like they do in London, but still the great majority would loyally carry it out, I believe.

3638. There would be no difficulty in a town, but in country districts it seems to me there is an absence of any authority who would be aware of these facts. As regards public alterations I should agree with you, but as regards private alterations, however desirable it may be, I want to find out what machinery can be invented by which people could be kept in order and made to attend to this?—It would be difficult to enforce for the reason that you say. The difficulty would be to get the knowledge, but I think that to a very large extent it would be voluntarily done. I think the great landowners and the small landowners too would as a matter of fact send in the information if it was known to be one of the requirements of the country.

3639. Your railway plans and completed railways in some manner or other are put upon the Ordnance survey. Do you know whether that is done by the independent survey of the Ordnance or by the assistance of any plans which you gentlemen afford them?—I made a railway through Lincolnshire about four years ago and that railway is partially shown on the Ordnance maps. It was shown just up to the place where it was finished at the time when the surveyors completed that place. The 3 miles further is not shown. I did not know that they were there, and they had got past the place by the time that we fenced in those 3 miles. That is a very great inconvenience for everybody. It shows a railway stopping in a field, and that is the latest of the 6-inch Ordnance maps.

3640. And the Ordnance Survey have not asked you to supply any plans?—No; of course I could have supplied them with the whole of the detailed plans which would have shown the whole of the railway from end to end.

3641. Drawn upon their map?—Oh, yes; as a matter of fact drawn upon the 6-inch.

3642. It might be an obligation then on all railway companies executing railways to supply to the Ordnance Office a finished drawing of the railway?—And

they would be very glad I am quite sure to do it on account of the great convenience it is to them to have their railway upon a Government map.

3643. (*Mr. Mather.*) On the same reasoning you would suppose that all local authorities would be very glad to supply the Department with their changes?—Very.

3644. So that they might have a record in the future?—They are the greatest sufferers by the plans not being supplied for correction.

3645. As regards the indices, you think them imperfect?—Yes, to this extent, and it is a very simple thing; they should be printed as far as possible on the same sized sheets of paper. Of course I know that the county of Rutland would be of very different size, so far as the map is concerned, from the county of Yorkshire; but there is no reason why a large sheet should not be taken and all the counties shown on the same sized sheets, so that you could bind them up.

3646. Is there any reason why counties should be shown on separate indices?—No; I think it would be better to show adjoining counties where you can on the same sheet; for instance, two counties might go on one sheet. The practical objection to the present system is that the indices might form very valuable atlases, not only for the purpose of knowing what sheets to get of the larger scale maps, but also for themselves alone.

3647. Would you advocate that the indices of the 25-inch, town maps, the 6-inch, and the 1-inch, should be on separate sheets of paper, or would you combine the three, the 25-inch, the 6-inch, and the 1-inch, on one index sheet, and indicate the difference by different coloured lines?—Yes; that is what I think I put upon those notes.

3648. You would prefer one index to different indices being indicated by different coloured lines?—Yes.

3649. And you would prefer that to a separate index for each sheet?—Yes.

3650. Do not you think the public generally would be less confused if there was a separate index to each scale?—The only thing is that you often want to see at a glance all the information; you do not want, having arrived at the information as to the sheet you want of the 6-inch, to have to go to another index and find out what sheets you want for the 25-inch. I think it would be a convenience if you could see at once that you wanted such and such a sheet of the 6-inch, such and such a sheet of the 1-inch, and such and such a sheet of the 25-inch, at once, without having to go to another index.

3651. (*Mr. Mather.*) You are speaking from the point of view of the civil engineer, not as a member of the general public, but as an expert engineer, who would use the maps for your public works?—No; in these matters I think what affects me would affect the general public. In a case of this kind it does not matter what purpose you want the map for; it is only a question of convenience in arriving at the knowledge of whether you can get the sheets you want; it does not matter whether the map is wanted for various purposes, or whether it is for the purpose of making a railway, you want the information just the same for the one as the other.

3652. But you bring to bear upon the index a knowledge and experience which very few people possess?—That is where the public are at such a disadvantage, so very few of the public know the advantage of the Ordnance maps, and I think it would be well if it were more largely known and if the index could be made a little more intelligible.

3653. The general public would take an index for each map, and so get at what they want much more readily?—I am speaking not as an expert, I am speaking more as a matter of convenience.

3654. (*Chairman.*) At present the sheet lines are confused as between the 25-inch and the 6-inch, and when a person takes up an index with two scales upon it he does not know quite which is the 25-inch, and which is the 6-inch scale in reading the index; but if it were clearly known that a red line meant the 6-inch scale, and a blue line the 25-inch, that difficulty would disappear?—In my opinion it would.

3655. Then again, with regard to the cost of these maps, you are inclined to think that the price is excessive?—No; I am inclined to think that the price at which the trade get them is exceedingly small; in fact I consider the price very small even to the public,

Mr. E.
Cooper.
2 June 1892.

having regard to what they get for it. I consider they are very cheap maps; but I think there is too great a difference between what the Ordnance get and what the public have to pay. I do not see why there should be such an enormous discount. For instance, Stanford has a monopoly. If I want to buy 100 sheets I must go to Stanford and pay 25 per cent. more than a stationer himself would pay if he wanted one sheet, and probably I should be paying 50 per cent. more than Stanford pays.

3656. Will not Stanford allow you as a large purchaser a discount the same as he would to a stationer?—I do not suppose so, but that difficulty is got over to a certain extent by a stationer saying to me, "If you will allow me 5 per cent. I will get them for you." And when I want a very big order I very often do that. I say, "Write me out an order for 20 sheets of Ordnance," and he takes 5 per cent. for the trouble of getting the order, and I get an advantage of 20 per cent.

3657. So that there is a way of getting over it?—Yes.

3658. Do you consider that the discount rate is too large, considering that Stanford has to store for the public and publishers: All the storage for the public and the publication seems to be on Stanford?—There is no very large amount of storage. It seems to me the profit is enormous.

3659. (Mr. Roby.) Are you aware that with private maps the bookseller gets the maps for half price to sell to the public?—I am not. I have not the slightest objection to publishers of private maps making any profit they can.

3660. Whereas Stanford gets 33 per cent. off instead of 50 per cent.?—Then does he sell for the remaining 8 per cent. to the trade?

3661. (Lieut.-Gen. Cooke.) I believe so?—Then if he only gets that it is very small.

3662. (Chairman.) And he has to do the warehousing?—If there is only that difference between the price to him and the trade price it is not much. Another slight inconvenience is this: you cannot get the 25-inch except in colours. Except by writing to Southampton or getting Stanford to write you cannot get the uncoloured 25-inch. Now very often we prefer the uncoloured ones because we ourselves mark the buildings we wish to show in our own definite colours, and when they are all shown red it shows more in fact than we want, and very often too you may want a sheet and not care whether the buildings are there or not, and in that case you do not want to have to pay double because of the red colouring.

3663. The colouring of the impressions adds very largely to the costs?—It does.

3664. Do you think the outline of the maps would be injured if instead of some being sold as skeletons and some coloured they all had the buildings hatched?—No; I think that would be an improvement, because that is as we ourselves very largely do them.

3665. The hatching would not interfere with your use of the map at all?—Not at all.

3666. In your opinion it would prevent the necessity for colouring?—The fact is that the map could be sold at a small price as an uncoloured map. I should personally prefer the hatched map.

3667. (Mr. Roby.) Would you prefer it to the uncoloured outline?—For ordinary purposes there might be cases where I should prefer to have only the outline.

3668. (Chairman.) There is a 25-inch map hatched?—I like this very much better than the coloured.

3669. (Mr. Roby.) The hatched map answers all purposes?—Oh, perfectly.

3670. (Chairman.) Of course the objection to the hatching is an objection which arises from the desire to alter the map. Do you think that the hatching adds to the difficulty of altering the maps?—No, not at all—less than the coloured one.

3671. Of course the coloured one is hopeless, and the skeleton is unsatisfactory?—The skeleton does not give the information if you want the buildings.

3672. (Lieut.-Gen. Cooke.) Would not you rather have liberty to get the coloured or uncoloured according as you like, instead of being obliged always to take the hatched?—That is the alternative I should prefer.

3673. (Mr. Mather.) Would not you prefer the alternative of being able to get one hatched and one unhatched?—No.

3674. If the hatching were done in very light lines (lighter than in the map you have seen) would it not answer all your purpose, because upon those lines you could draw and project additions, and so on, and colour what part you liked, so that the hatching in that respect would be no practical difficulty, and if one hatched edition were sent out it would answer every purpose?—It would, certainly.

3675. Simply this (referring to hatched map) but very much lighter?—Very much lighter.

3676. (Lieut.-Gen. Cooke.) The question really is, would you prefer to have this map just as it is, and only this map, or would you prefer to have this map done without hatching and have the power of buying it either coloured or uncoloured?—I should have this one (hatched) if it could be made lighter. If that could be hatched lighter then I would prefer to have the one edition. In the plans for the Lancashire, Derbyshire, and East Coast Railway, the stippling, I think, is done on stone; Waterlow's do it.

3677. (Chairman.) You have constructed railways in foreign countries, Italy and Germany?—I have not constructed one in Germany; I have constructed railways in Italy. In Germany I have had to do with one of the railways, but have never actually constructed one.

3678. Have you equal facilities there in the way of maps?—No.

3679. What maps have you in Italy, on what scale—a map equivalent to our 1-inch?—It is little less than that. (The Secretary.) 1/100,000, or $\frac{1}{6}$ to an inch.

3680. (Chairman.) Is that Italian map as useful a map as the English 1-inch map?—No.

3681. Is it good in point of survey?—Not in point of survey except so far as well-defined objects are concerned, such as main roads and railways, and any very defined points.

3682. The position of all villages?—The position of all villages is of course accurate, but the filling in is to a very large extent sketched.

3683. All the hills?—Yes; and the bye-roads.

3684. The line of the rivers is correct?—The rivers are fairly correct; but I do not believe that in many cases the rivers have been actually surveyed, not the whole of their route.

3685. With regard to the German map?—I have never had the means of testing its accuracy; but my objection to it was that it was far too heavy; it is too much filled in for the scale.

3686. Is that in connexion with any survey you were thinking of making?—It was in connexion with a railway I was asked to prepare an estimate for, and to go over the ground, that was to run near Cologne.

3687. You had no facilities such as our 6-inch map afforded you?—No; nothing.

3688. There you had something equivalent to our 1-inch, and it was not as good?—No.

3689. Of France have you any experience?—I have had no experience actually in France, although I have seen their maps; but I object to their maps for very much the same reason, that they put in such a great deal of matter which is nothing more than ornament, nothing more than draughtsman's work.

3690. (Mr. Mather.) So far as your experience goes there is nothing at all published in other countries to compare with our 6-inch map for railway purposes?—Or for any purpose. There is no map published which can in any way compare with our 6-inch, so far as my knowledge goes, anywhere in the world.

3691. And with regard to the 1-inch, what do you say?—I consider our 1-inch is superior to any similar scale of map that ever I have seen.

3692. Chiefly because it is more accurate in regard to the details shown?—Yes, that is so; there is less attempt at making it a picture. What there is is accurate.

3693. The whole of our maps are based upon triangulation, and that appears not to be the case with the French maps?—Oh, no.

3694-5. (Chairman.) Do you know the Swiss maps?—No; I have never had anything to do with the Swiss

maps. I heard the former witness advocate a different scale, a larger scale than the 1-inch, but less than the 6-inch. I think it would be the greatest mistake to have any more scales.

The witness withdrew.

Mr. G. H. LEANE called and examined.

3697. (*Chairman.*) How do you describe yourself?—As a civil engineer and surveyor.

3698. Resident where?—21, Queen Anne's Gate, Westminster.

3699. Have you had experience of the Ordnance maps?—Yes; I have had considerable experience.

3700. Of all scales?—Yes, I think so, pretty well.

3701. Beginning with the town map?—I think my first experience was with the skeleton map of London—the old skeleton map.

3702. Five feet to the mile?—The 5 feet to the mile.

3703. Have you had experience of the 10-feet scales in other towns which are more modern?—Yes.

3704. The 5-feet map of London is an engraved map?—Yes.

3705. And the 10-feet map of other towns is photo-zincographed?—Just so.

3706. Supposing that 10-feet map had been a 5-feet map, would it have answered the purpose to have had it as a zincographed map, or would it have failed through coarseness?—I think it very probable it would have been somewhat inconvenient in close work from being so coarse. I should not like to see the 10-feet map abolished where already made. Personally, I do not very much care whether it is a 5 feet to the mile or a 10 feet to the mile plan, so long as I can have a map sufficiently clear for tracing.

3707. Do you think a 5-feet zincograph map would be sufficiently clear for tracing?—I think so.

3708. The lines would not be too coarse?—No; I think not.

3709. And you could alter on it?—Yes.

3710. The fault of these maps is that they soon become obsolete, out of date?—Yes; that is a fault no doubt.

3711. Have you turned your attention to the general question whether they could be revised?—I think the observation of the last witness as to the revision of towns would apply very well, namely, that local authorities should give routes of new railways and roads, but I do not think that anything should be taken from an outside source without proper examination from the Ordnance authorities who are accustomed to deal with these plans. I do not think that anything would be accomplished by surveyors of all sorts and degrees sending in work with a view to its being adopted without being thoroughly checked.

3712. You think their sending it in would give great facilities to the Ordnance Survey Department, and they might check it at very much less cost than they would incur by making a new survey?—Really I do not know that that would necessarily follow, because in putting new work on to an old plan where the basis is correct it does not take very much longer, as I have found, to do the whole work than it does to correct some one's bad work.

3713. (*Mr. Roby.*) But it would be useful as giving information to the Survey where alterations had taken place?—Certainly.

3714. For what class of work have you had experience of these town scale maps?—In a great deal of railway work; for instance, in these Metropolitan surveys and for the District Railway, and for some part of the Metropolitan itself, and in railways through other towns both proposed and constructed, and I am now using a good many of the maps for estate purposes.

3715. (*Chairman.*) Have you heard the observations made about their being published in two forms, namely, skeleton and coloured, and the objection there is to the coloured map?—Yes, I heard something of that.

3716. I am talking of the big town plan now?—Yes.

3696. (*Mr. Mather.*) Do you think that it would be an advantage to modify our 6-inch map by hill-shading?—I think to hill-shade the 6-inch would be an impossibility. You would have to shade such an enormous surface.

Mr. E. Cooper.

2 June 189

3717. Do you think it would answer to publish that as a hatched map?—For myself, I should be very sorry to see the plain map abolished. I should like to be able to obtain the plain map, and I think that perhaps the plain map might be made to sufficiently indicate buildings by dark-shaded lines, which are always put on the south and east sides of the buildings, and the dark lines which indicate water which are put on the north side and the west side of water.

3718. Would the general public understand that?—Yes, I think so. I should be very glad, for town and estate purposes, if these plain maps could always be supplied. I have found in the hatched plans, with which I have had something to do, that much of one's time is taken up in eradicating the work.

3719. In eradicating the hatching?—Yes, and it is a great deal of trouble. If the maps were quite plain we should have good paper to work on instead of paper the surface of which has been destroyed.

3720. You think the public should not object to having to pay a large sum of money for the coloured plan?—I think if they require a coloured plan they should be prepared to pay for it; but I do say we ought, if possible, to be able to obtain a plain map, if we prefer it, without trouble.

3721. (*Mr. Roby.*) Do you practically yourself ever buy the coloured maps?—Not if I can get them plain.

3722. (*Chairman.*) The observations with regard to the 10-feet map would also apply to the 25-inch map?—Yes; with regard to the 25-inch map I have ordered 70 sheets. I ordered them plain, and I have had them plain.

3723. You objected to having them hatched, although you incurred no extra cost?—Yes, I preferred to have them plain.

3724. (*Lieut.-Gen. Cooke.*) You were suggesting having the houses shown by a dark line?—Yes.

3725. But do not you think that is rather apt to cause inaccuracy, when you have a very thick line on one side of a house in measuring; do not you think a thick line may be misleading as to the real position of the end of a house?—Well, in practice I do not think that difficulty comes in for this reason: the whole of the buildings are drawn first in pencil, and penned in with a fine line in ink, then the thick line is added on the inside of the building, so that the measurement you take would include the whole.

3726. You do not mean penned in—shaded with the pen?—Penned in.

3727. A dark line ruled?—Ruled.

3728. The only thing I thought was, that a dark line is apt perhaps not exactly to keep within the thin line. It requires some delicacy of manipulation to do that?—There is no difficulty, I think, with regard to that.

3729. (*Chairman.*) Have you any memoranda of the evidence you wish to give?—No, I have not; I have had such short notice.

3730. Perhaps you will tell me the special points upon which you wish to give evidence?—On the general utility of the maps, and the subjects you have examined Mr. Cooper upon. Those are subjects with which I am familiar.

3731. Have you laid out any railways over England?—Yes, a great number.

3732. What is your course of procedure in laying out a railway?—Usually I endeavour to obtain the new 1-inch map. In that you have a very valuable indication of where it is possible to run a line.

3733. (*Lieut.-Gen. Cooke.*) The 1-inch with contours you are talking of?—Yes; and having determined about the possibility of running a line from point to point as required by the promoters, I then obtain the 6-inch Ordnance, and lay it out more exactly upon that. As a rule I now deposit on the 6-inch scale all open country work.

Mr. G. H. Leane

Mr. G. H.
Leane.

June 1892.

3734. And on the 25-inch scale or a reduction of that all the close work?—Yes.

3735. (Chairman.) Have you made use of the 6-inch maps where they have been contoured on the old plan of 25 feet intervals as well as when they have been contoured on the new plan of 100 feet intervals?—I have used them in Yorkshire; those were magnificent plans when they first came out, but the plates became so worn that the fences for miles had sometimes to be reinked in before we could do anything.

3736. Are the 100-foot contours sufficient for your purpose?—I should prefer them closer than that.

3737. You would prefer them to go back to the old plan, the 25-foot interval?—I should prefer that in a moderately level country certainly.

3738. The 100 feet is too great an interval?—I think so.

3739. And obliges you to do a great deal of similar work yourself?—Yes, it does; of course we work that kind of work in a great deal with aneroids.

3740. In working from east to west have you found any difficulties arising from the different meridians?—Practically no difficulty, we always have a map close at hand for what we require, and we can join it on, whether the meridian is the same or not.

3741. Have you found the maps accurate?—I have found them generally very accurate.

3742. Have you found mistakes about the positions of fences?—Occasionally. Every surveyor is liable to make mistakes, and they are not always discovered by the examiner.

3743. Is that with regard to the actual position of the fence or the omission of it?—The actual position, but cases of that kind are rare. I made a new survey some years ago for the Duke of Bedford at Chenies; the Ordnance map was in the course of being surveyed at the time. When their map came out their map and my map were compared, there were only three cases in which there was a difference in the fences.

3744. Were they fences omitted?—No; simply a chain plotted wrong in each case.

3745. A chain short or a chain too much?—For instance, in the case of one fence abutting upon another, the abutting fence might be a chain out of position.

3746. An arithmetical blunder?—Yes.

3747. (Lieut.-Gen. Cooke.) You say you would prefer 25 feet contouring in moderately elevated country; up to what altitude would you define a country as being moderately elevated?—I do not know that I could quite limit it to an altitude, but it seems to me a general fact that after 500 feet in height has been reached the country is rougher—the rises and falls are more abrupt.

3748. You would put it this way, that you would have more contours to the horizontal mile; it would ensure you having more contours in a level country than you would have in a hilly country if you had more contours to the mile where it was not so hilly?—That would work itself out. I think where the rises are very abrupt we could do with fewer contours.

3749. (Mr. Roby.) Where the rise is gentle you want more?—Yes.

3750. (Lieut.-Gen. Cooke.) Supposing a mile horizontal with different slopes, you would have a greater number of contours in different parts in proportion to the slope?—Yes, it follows that if you put a contour every 25 feet there must be more contours shown in a horizontal mile where the ground is rough than there would be where it is comparatively level.

3751. (Chairman.) Would that apply to instrumental contours, or would you be satisfied with eye-sketched contours, or water-level contours, or aneroid contours for the intermediate ones?—I have found those on the Ordnance maps work out exceedingly well, the pickets indicated by little circles on the maps show points actually surveyed and levelled. Speaking as an engineer, we should be able to know the value of the others pretty well, and we should not be misled by them if they were a little wrong, so that I think if there were a certain number of actual surveyed points and the remainder sketched in as now, it would do very well.

3752. On the 6-inch map now they are all instrumental contours?—I am not quite sure of that; I found them very good.

3753. In the old Yorkshire map they are partly interpolated?—Yes.

3754. And that answers?—Yes; I think that answers very well, because that gives you a sufficient indication of the nature of the ground, and you do not rely upon them for absolute levels.

3755. On these large-scale maps, the 25-inch and the 6-inch, do you think there is too much detail?—Yes; considerably too much detail, I think.

3756. What would you leave out?—I should leave out all garden paths and the dotted lines generally in courts and alleys, small buildings such as hen houses, dog kennels, and such like structures that are simply tenants' buildings; in fact, I should have nothing but what it likely to remain as permanent work.

3757. About hedgerow timber?—With regard to hedgerow timber, I find there is very great difficulty sometimes in making a tracing from a map which is so covered up by this timber, and I should prefer that only prominent trees should be surveyed and shown, and those should be actual points which you could rely upon. In the maps that I am using now, (the 25-inch Ordnance,) although only made, I think, 10 or 12 years ago, half of the trees shown are gone; they have been cut down.

3758. In the hedgerows?—Not in the hedgerows because they are in a mass but in the hedges. What I mean by a hedgerow is a narrow planting.

3759. When I said a hedgerow I meant a hedge?—The trees there are more than half cut down.

3760. I suppose their being drawn on that hedge prevents you in making a tracing from that map getting the actual true position of the fence?—Yes, it is difficult when you are making a large tracing to see what you are doing, you must frequently lift it up to see what is underneath.

3761. (Lieut.-Gen. Cooke.) If you wanted to make alterations in that part it would be exceedingly difficult to do it?—Certainly it would be.

3762. You would only put forests, woods, orchards, and isolated big trees down?—Exactly.

3763. (Chairman.) Have you made use of the area-books?—Yes, I have.

3764. Are you aware that on the sheets of the 25-inch map recently published the area books have been abolished, and the actual acreage, the actual area, is stamped on each plot?—Yes; I have been very much troubled in consequence.

3765. You do not like that system?—I do not like that system, because there is neither one thing nor the other complete. Upon the sheets on which I am now working half of it is done one way and half the other.

3766. Supposing it was all done one way?—I should prefer the book plan before the other, because there are many alterations since that map was made; fields have been sub-divided. If it was only a question of taking a number out and putting a number in, it would not be so much, but when you have to erase all the area quantities and substitute others it is troublesome.

3767. Do you think the numbers are useful without the area book? Supposing that the area book did not exist, would the numbers be of any utility?—No; certainly not, because there is nothing to refer them to.

3768. The numbers are useless unless there is an area book?—Exactly.

3769. You would prefer to have the numbers and an area book to having the actual areas on the plots?—Certainly; you never know when you have the whole of the parish when you have simply the areas in the fields. It is sometimes difficult to tell where one enclosure ends and another begins; occasionally there would be an omission of a quantity, but if you have the numbers you get some assurance that every quantity has been taken, and every piece of land accounted for.

3770. Is it not quite as difficult to know where the area is calculated to when you have a number on a field?—Yes.

3771. There is something braced into it; you are not quite certain what, and you look about to see if there is any number belonging to that braced part; you are not quite certain what is braced; is not that as great a difficulty?—Yes; that is as great a difficulty for the special number, but you have this assurance

that when that number was put in it was intended to indicate something, and there is no number missing; they all follow numerically.

3772. (*Lieut.-Gen. Cooke.*) You get a tabular list of numbers and you know they are all right?—You may be sure those numbers have been balanced up, and that nothing has been omitted.

3773. (*Chairman.*) Do you think it would be more convenient if the numbering was by sheets instead of by parishes?—If you were going to commence again or nothing had been done, I think I should agree to that, but as the system is now so far advanced, I should be sorry to see a new system introduced.

3774. Making a change would introduce a difficulty?—I think so, you never know where you are; the difficulty with the Ordnance has been because of the changes. In the old 1-inch map there were so many changes made that it is a difficult thing to mount a few of them together. This was only from the different systems of the different men who had control for the time being.

3775. You have not met with the difficulty which has occurred from all the numbers of the sheets having to be changed in consequence of a change of boundary?—I know that such a trouble would arise if you cared to alter all the numbers, but that is a thing I should never attempt to do.

3776. How would you avoid it?—I should strike out some of the numbers if it was necessary to strike them out and omit them from the book entirely; there would be no appearance of those numbers in the book. When other numbers were required to be put in I should put them in as 1a, 2a, and so on with the altered quantities they represented. I should not alter a single thing that had once been done where it could be avoided.

3777. (*Chairman.*) Perhaps you have heard what the last witness said about the size of the quarter-sheets of the 6-inch scale?—Yes.

3778. Do you object to their being of that size?—No; I do not object to the size at all, because sometimes the advantage is one way and sometimes another, and I think it is very equally balanced, and if the sheets could be issued more quickly and better, and more cheaply than in the way they are issued now, I for one should not object to it at all. We want the maps; that is the great thing.

3779. With regard to indices are they satisfactory now?—These new ones that have been supplied to me are exceedingly satisfactory. For instance, this one of the county of Northampton, showing the maps issued on the 6-inch scale. This is I think a very good index indeed of that particular scale. It shows the parishes so clearly. If they were to issue such indices as these at 6d. I think we could not possibly have anything better.

3780. (*Mr. Roby.*) Is the colouring of the parishes important? You could do very well without that, I think, could not you?—We could do without it, but it is soon done when they are running them through the stones; I think only four colours are necessary.

3781. (*The Secretary.*) They are stencilled by hand?—I should prefer them coloured.

3782. (*Chairman.*) The indices which are published showing the 25-inch map and the 6-inch map on the same index are somewhat puzzling, are they not?—Some of them are. I do not know what the new ones may be like.

3783. (*The Secretary.*) The combined index for the 25-inch, the 6-inch, and the 1-inch is an old form?—The dark lines I see are the 1-inch. I do not think it ought to puzzle any ordinary individual to find out what it is.

3784. (*Chairman.*) If these lines were printed in colours, and the red belonged to one scale and the blue to another?—If the 1-inch for instance remained black, I think they would be sufficiently plain, but at any rate the 6-inch might be red, as you say, and the others dotted red.

3785. We understood from one of the witnesses that his customers were very much puzzled, and were constantly sending for wrong sheets?—Well, I think this is sufficiently clear, especially as you suggest this red line showing the 6-inch.

3786. If it was all coloured it would be clearer?—Quite clear then: Those 25-inch divisions might go in as dotted lines and do quite as well.

3787. With regard to the revision of the maps, how often do you think they should be revised?—For the country districts I think they should be looked over every 15 years.

3788. And for the town plans?—For the town plans where there are active operations going on revision cannot be too frequent. For instance, there are some places that are being added to every year, seaside resorts, and so on; I think they might be brought up to date as closely as it was possible to do.

3789. An edition every 12 months?—I do not know about an edition every 12 months, but every four or five years they might be overlooked.

3790. And by tracing you ought to be able to get accurate information every 12 months from Southampton without an actual publication?—Yes.

3791. Whenever a parish boundary is altered do you think there ought to be a new edition of the map?—I do not think so for the parish.

3792. It would be extravagant you think?—I think so; I think they can afford to have their alterations put off.

3793. What do you say as to the municipal boundary?—I do not think the municipal boundaries matter much either. I think the public should not be catered for as individuals, but as a general public.

3794. The parties concerned would always be able to know where the boundary was?—They would know; the general public does not want to know.

3795. With regard to our new 1-inch map, are you satisfied with the 1-inch map?—I am quite satisfied with that map. I think it is a beautiful map.

3796. Is it as well engraved as the old one?—Yes.

3797. (*Mr. Roby.*) Do you mean the 1-inch sheet?—The skeleton with the contours.

3798. (*Chairman.*) With regard to the one with the names on, have you compared it with the old one?—I have found it sufficiently good.

3799. Do you think it is over-burdened with names?—I do not think it is.

3800. Have you noticed the lettering of the parishes on it, the parish names?—Yes.

3801. On the Sussex sheets, for instance?—I cannot say I have in the Sussex sheets; I have in the Wiltshire sheets.

3802. (*Chairman.*) I do not think the Wiltshire sheets have got the parish names I speak of?—For my own purposes I have wanted to know the parishes, and I have printed them on roughly, so that they are not sufficiently indicated there.

3803. You have not got the parish names there?—No.

3804. This is the advanced edition by zincography. Do you think that is a satisfactory map?—Yes, very satisfactory; there is all on it that is necessary.

3805. That is coloured in parishes; you would like that?—I should like that very much.

3806. Have you seen the hill-shading of the new maps?—Yes; I have used some of them.

3807. Is that satisfactory to your eye?—Yes.

3808. Would you like the maps published in black or with the hill-shading in brown?—That makes two printings.

3809. Yes; but there is no occasion to make any objection on the ground of the two printings, because all the maps of England are going to have the hill-shading as a separate plate?—I should prefer it in brown colour, because it does not so much interfere with the printing of the names.

3810. (*Mr. Roby.*) You think it important to have the hill-shading; you are not content merely with the outline map of the country?—For engineering purposes we would be content with the contours, but for general purposes I think hill-shading is satisfactory.

3811. (*Chairman.*) Do you know that district. (*Witness was handed a map of the Isle of Wight*)?—Yes.

3812. Do you think the hill-shading is extravagant, or that it is carried too far down?—I do not think it is.

Mr. G. H. Leane.

2 June 1892.

Mr. G. H.
Leane.
2 June 1892.

3813. (*Mr. Roby.*) Do you approve of the thick paper on which this is printed, or would the thin paper be sufficient?—No; I should like the thick paper. Double elephant drawing paper is what we should prefer in all cases, because it does not contract so much as the other, if it is well seasoned and alterations are more easily made upon it.

3814. (*Chairman.*) Would you ask that a special edition should be prepared, the extra expense to be paid by the persons buying it?—On special paper do you mean?

3815. Yes?—I should have been very glad indeed sometimes to have paid something additional to have had the map on really good paper.

3816. (*Lieut.-Gen. Cooke.*) The 1-inch?—Yes, both the 1-inch and the other scales. I should have been very pleased to have paid the difference. I know there is more difficulty in printing on the hand-made "double elephant," because it is a hard paper; it does not so readily take the impression.

3817. (*Mr. Roby.*) I thought "double elephant" merely indicated the size of the sheet?—There is also a quality attached to it. I think it is hand-made.

3818. (*Chairman.*) I understand the Ordnance Survey will print if asked on special paper, but that has reference only to the smaller scales?—Then nothing could be better than that.

3819. (*Mr. Roby.*) Do you habitually mount your maps?—Generally I mount them when I am taking several together. I always back them then.

3820. If it was mounted would not the thin paper be sufficient?—I do not think that would be sufficient, because there is no substance for erasing. At the same time it might prove useful to the general public to have maps printed upon thin paper or tough tracing paper which could be folded into envelopes and transmitted with greater facility through the post, or could be used

as tracings are now used for transferring portions of the map to special plans for the conveyance of properties and such like. (See Appendix XVII.)

3821. (*Chairman.*) Have you any experience of foreign maps?—In Syria.

3822. I suppose they are rough?—They are made by the Palestine Exploration Fund.

3823. These are our own maps?—They are not so good as ours.

3824. Are there any other points you wish to mention?—I think that there is nothing that I should wish to mention except that we want the plans as quickly as we can get them. We cannot always obtain a complete map of a district on the scale we wish, and are then obliged to adopt some other scale for the remainder.

3825. You mean because the map is not yet completed?—Not yet completed. We want it completed.

3826. The 1-inch map of England is practically completed, that is to say, it will all be out this year, except a belt across the south of Lancashire and Yorkshire?—I am very glad to hear it.

3827. The whole of the 6-inch map of England, and the 25-inch map of England, except parts of Lancashire and Yorkshire are all completed. Except those you can get anything you want, can you not?—I am not quite clear; I have been wanting some maps of Wiltshire for a long time, the new 1-inch.

3828. (*Chairman.*) Is the old 1-inch map of the south of England a bad map?—I have come across some bad ones.

3829. Out of date or originally bad?—I cannot tell whether they are originally bad, but in one place the roads are all wrong.

3830. Is there anything else you wish to lay before the Committee?—No, I think not.

The witness withdrew.

Adjourned to Tuesday, June 14th, at 11.30 o'clock.

Board of Agriculture, 3, St. James's Square, S.W.

ELEVENTH DAY.

Tuesday, 14th June 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
Mr. HENRY JOHN ROBY, M.P.

Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Sir GEORGE LEACH, K.C.B., R.E., called and examined.

Sir G. Leach
K.C.B., R.E.
4 June 1892.

3831. (*Chairman.*) You were formerly Director of the Ordnance Survey in Ireland?—I was formerly in local charge of the Irish survey under the Director-General, who was at Southampton.

3832. And subsequently you were for many years secretary to the Copyhold and Tithe Commission?—At first for some time I was one of the Assistant Copyhold Enclosure and Tithe Commissioners in charge of the Survey Department of the Commission. Then I was made one of the Copyhold Enclosure and Tithe Commissioners, and subsequently the title of the office was changed to that of the Land Commission, and when the Board of Agriculture was established I was appointed by Her Majesty Secretary to the Board.

3833. You are well acquainted then with the Irish maps?—I was well acquainted with the Irish maps at that time; it was 30 years ago; indeed I have considerable knowledge of them at the present time also.

3834. At the time you took charge was the 6-inch map of Ireland completed?—The 6-inch map of Ireland was at that time completed. My occupation was the revision of the maps of the northern counties. Probably the committee are aware that the survey of Ireland on the 6-inch scale was the first survey upon a large scale which was undertaken.

3835. What do you mean by the large scale—the 25-inch?—The 6-inch scale was a large scale as compared with the 1-inch scale which was the scale upon which

the map of England had at that time been produced. That large scale was adopted for the purposes of valuation and for the purposes of valuation only at that time, and the survey of the northern counties of Ireland was, comparatively speaking, incomplete. That is to say, it showed only the principal topographical features, not fences or other minor details, and my duty when I went to Ireland in 1844 was to complete the maps of the northern counties which had been left incomplete in the first instance. As the original Irish survey progressed it was found that a complete field survey could be made without much additional expense, and it was also found that it was very desirable for the purposes of valuation that it should be made a field survey; it was the field survey which enabled the tenement valuation in Ireland to be made. The first valuation was a valuation only by townlands, but as the work progressed it was found that the tenement valuation would be extremely desirable and the improvement of the maps rendered a tenement valuation possible.

3836. In the first instance you only ascertained the area of the townland?—Only the area of townlands.

3837. You had nothing to do with the valuation, I suppose?—Nothing whatever.

3838. Then you extended that to the area of the fields?—No, the area of fields was never ascertained for the 6-inch survey, merely the area of the townlands, parishes, and other divisions.

3839. How do you apply the map then for valuation purposes, not having any areas upon it less than the areas of townlands?—The Valuation Department obtained the areas of the tenements by measurements, I believe, from the maps.

3840. That was done, I believe, privately?—That was done by the Valuation Department, not by the Ordnance Survey.

3841. And that was never published?—That was never published excepting in the valuation lists.

3842. In the parish valuation lists they refer to the areas of fields in the 6-inch map?—No. There is a division in Ireland which we have not in England. The parishes are divided into townlands. The parishes are considerably larger than they are in England and they are divided into townlands which contain an average of about 300 acres. A valuation was made first of all upon those townlands.

3843. Are those townlands generally coincident with the extent of private property?—The boundaries of townlands were very generally coterminous with the boundaries of private property.

3844. Not universally so?—Not universally. It often happens that a townland might belong to two or more people, but, as a rule, the townland boundary was a property boundary.

3845. (*Mr. Roby.*) On the other hand, I suppose two or three townlands often belonged to the same person?—On the other hand, in many cases several townlands or a number of townlands belonged to the same property.

3846. (*Mr. Mather.*) Why was the term townland given to this land survey?—It was called by various names, and the name townland was adopted as the best.

3847. It is land outside the town, of course?—Yes. You have townships in Scotland, and in the north of England you have a great many parishes divided into townships. In the same way in Ireland you have parishes divided into townlands, only the townlands in Ireland, as a rule, are smaller than the townships in England.

3848. (*Chairman.*) In the transfer of ownership of these townlands from one person to another, what use was made of those 6-inch maps?—The maps were used, I have no doubt, very generally as a means of transferring property, and probably the greatest use which was made of them was under the Landed Estates Court.

3849. Did the Landed Estates Court require the production of this map as proof of the area that they were dealing with?—I had better explain to the Committee what occurred with reference to the services of the Ordnance Survey being made available for the Landed Estates Court. When the Landed Estates Court was first established the judges experienced considerable difficulty in getting the lands they transferred accurately mapped, and so strong was this feeling that I may mention that two of the judges

told me—using this very strong expression—that they never went to bed feeling satisfied that they had not given an indefeasible title to land which they had no right to deal with, and they applied to the Government in Ireland for assistance. Sir Thomas Larcom, who had been the head of the survey of Ireland, being then under-secretary, told them he thought the best thing to be done was to ask the Ordnance Survey to undertake the work for them. I was at that time in Dublin, and I organised the arrangements under the Landed Estates Court, under which we perambulated the boundaries of the properties to be sold on the ground, having previously given notice to the adjoining owners, and then accurately mapped them, and the map which we prepared was attached to the conveyance by the Landed Estates Court; and I may further add that Judge Longfield told me afterwards he then went to bed comfortably and slept comfortably, for he felt quite satisfied that he had conveyed the right land.

3850. The 6-inch map was already in existence?—The 6-inch map was already in existence.

3851. And you took the 6-inch map, and by that you established the boundaries of the estate you were dealing with?—We used the 6-inch map, and perambulated the boundaries with it, and upon it we represented the boundaries, and prepared the maps which were attached to the conveyances by the Landed Estates Court.

3852. (*Lieut.-Gen. Cooke.*) In doing so you had to survey considerable additional features. You did not find all the features on the original 6-inch; you had to survey them?—We did not go into the question of interior divisions unless it was necessary to define the different holdings.

3853. You found in order to get at the division you had to survey the external features of the country?—To a certain extent, we had certainly where the features were altered.

3854. (*Chairman.*) From your knowledge of the practice, do you think that the same practice might be judiciously introduced into England?—I think the same practice might be introduced into England with very great advantage. In point of fact now, at the present time, I believe it is rare to convey property without a map. Formerly, as I daresay you are aware, the description of the property conveyed set out that the property was bounded on the north by the property of so and so, and on the south by the property of somebody else, and so forth, but those descriptions were very uncertain and very liable to error, and when the Copyhold and Enclosure and Tithe Commissions were first established they determined that all their transactions connected with land, and they were very numerous, should be based upon maps, and that has led no doubt to the adoption of maps generally upon conveyances, and so far as I am aware of the practice at the present day, in nearly all conveyances, and in nearly all mortgages and documents dealing with land, the description of the land is by map, and I see no reason whatever why it should not be generally adopted, especially now when we have got the Ordnance Survey completed over the entire country.

3855. In adopting that practice you would not consider it necessary to have the assistance of the Ordnance officers on every occasion as apparently you do in Ireland?—Certainly not, unless the same system was adopted that was adopted there. A Landed Estates Court has been established in Ireland, which practically now conveys all properties; almost all properties sold go through the Landed Estates Court.

3856. If then conveyance were made through a court you think you would require an officer of the character of an Ordnance surveyor to establish the boundary on the map?—Certainly.

3857. But as between private individuals acting in accord with one another, that is not necessary?—No; at the present time I should mention that the Ordnance Survey is preparing the maps for land registry. For a considerable number of years it was done under my own direction; but when there was a prospect of the work of the Land Registry Office largely increasing, I felt that it would not be desirable that a second large survey establishment should be formed here, and suggested to the Registrar that it would be better that the work should be transferred to the Ordnance Survey, and that was done, and the work is now done by the Ordnance Survey Department instead of by this office.

*Sir G. Leach,
K.C.B., R.E.*

14 June 1892.

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3858. Then the practice of the Land Registry Office is to take the private map which is brought to them, and identify it with the Ordnance map and place the Ordnance map on their registration deed?—Yes.

3859. Having previously identified it by means of a competent officer with the private map supplied?—Yes. Applicants are required also to produce the sheet of the Ordnance map as well as any private maps they have, and the Ordnance surveyors at the Land Registry Office, if they are not satisfied, call for further information to be supplied which will satisfy them that they have got the right lands.

3860. (*Lieut.-Gen. Cooke.*) Supposing there was a large amount of re-survey or revision required in adjusting the private map to the Ordnance map, would an Ordnance surveyor be sent to the spot to do it?—I presume that he would, and that the Ordnance surveyor would ascertain that he had got the correct boundaries.

3861. (*Mr. Mather.*) The private map itself would probably be a copy of the Ordnance map?—It would.

3862. So that the rectification of the Registry Office is simply to put on the original Ordnance map, of which a rough copy has been supplied by the applicants, the real features, the real divisions to make a *bonâ fide* definition of the land?—Yes, I might mention that in Ireland under the Landed Estates Court we define the boundaries with great exactness, that is to say, whether it was the centre of the fence or so many feet from the fence, or the centre of a road, or the centre of a stream, or the side of a road, or the side of a stream, defining exactly what the boundaries are. That was also done in England up to a certain date. Afterwards, under Lord Cairns's Act, it was considered better not to define the boundaries with great exactness, and it was specified in the Act that the boundaries shown on the maps should not be considered as the absolute boundaries; I believe that was done upon this principle; that disputes might exist between adjoining proprietors, which by lapse of time would adjust themselves, and it was better to let sleeping dogs lie, and also that it rendered the mapping less expensive, because notice had not then to be given to all the adjoining owners.

3863. (*Chairman.*) As a matter of fact, unless the fence is a wooden paling, or iron railing, the boundary, as shown on the Ordnance map, is never correct?—The Ordnance map does not attempt and could not attempt to show the boundaries of property. It shows what exists upon the ground, be it an iron fence, or be it a bank, or be it a ditch or a stream.

3864. As the boundary shown is always the middle of the fence, it cannot be the true boundary?—The lines on the Ordnance maps represent the fences and other objects which exist on the ground, which may or may not be the exact property boundaries. The Committee will at once understand that it would be impossible for the Ordnance surveyors to find out in every case or to settle a property boundary, whether it was 3 feet from the fence, or 2 feet from the fence, or 4 feet from the fence, or, as I have known cases, where they have what they call a "deer leap," which is about 16 feet from the fence. Now it would be quite impossible to show that upon the Ordnance map, and most undesirable, because those boundaries are undefined boundaries; but it is clearly desirable that the Ordnance map should show what exists upon the ground.

3865. (*Mr. Roby.*) Physical features, not lines?—Yes.

3866. (*Mr. Mather.*) How do you show the undefined boundaries on the maps?—You do not show the boundaries, you show the fence.

3867. You show where they come to about, but in the conveyance of land, in order that the right land may really be conveyed to the purchaser, you have to put the real boundary, the legal boundary, on the map?—Under the existing Act they do so, I believe, still in Ireland, but not in England.

3868. When this question is brought before the Registry Office do the Ordnance Survey officers merely verify the boundary on the map which is a visible boundary?—That is all.

3869. (*Mr. Roby.*) Do not they also mark with ink?—They do on the map, but they only show the physical boundary. Supposing the boundary of an estate was a road, they would not show the boundary along the centre of the road but at the hedge. If it was a stream they would run a line of colour along the stream,

but they would not define exactly what the boundary was. Supposing that the boundary line was a fence, they would draw the colour line up to the fence, but they would not show whether the exact boundary was 2 feet or 3 feet or 4 feet beyond it, whichever it might be. The exact boundary whatever it might be would be implied, and would rest as heretofore between the adjoining owners.

3870. (*Mr. Mather.*) What I want to get at is this: on the question being put in the Registry Office what is the boundary of land which is about to be conveyed and registered, what mark do you put upon the Ordnance map in addition to the natural and visible boundary which of course exists?—I believe none is put on. The boundary is not exactly defined. It was thought that the question of boundaries would adjust itself between proprietors, as is no doubt the case, except where dwellings are crowded, as in towns, and space is valuable. That was the very spirit of Lord Cairns's Act.

3871. (*Chairman.*) If the Land Registry Office in England were to undertake to give an indefeasible title in your opinion would it be necessary to define the boundaries much more accurately than is the present practice?—No, I think it would be better to follow the present practice, because there is practically in country properties no difficulty as regards the boundaries.

3872. How would you get over the question of indefeasibility of property?—You get over it by the Act, which says that the boundary shall not be absolute. It is provided for in Lord Cairns's Act.

3873. In the Act of 1882?—I forget the exact date. I think it was before 1882. It is the last Land Registry Act.

3874. Has your attention been drawn to the numbers on the 25-inch map?—It has been very much drawn to the numbers.

3875. Do you use those numbers by way of reference?—They are used in this office by way of reference.

3876. Are you aware that those numbers are frequently changed?—I am aware that they are changed occasionally when the maps are revised, and to meet that—I think General Cooke was then Director General of the Ordnance Survey—I very strongly urged that the year in which each map was published should be put on the map, so that in referring to the Ordnance map in deeds or documents it could be referred to as number so and so in parish so and so on the Ordnance map of a particular date, which is most important, otherwise you might have a second edition of the map published and the number might be altered.

3877. (*Mr. Mather.*) If that were done you think there would be no confusion?—I think there would be no confusion.

3878. Revision after revision might be made, but with the date put on it would be easy to define the maps you require?—It would be easy to define the maps, because the date would fix the map you refer to. General Cooke adopted the suggestion, and I think upon every map now published it will be found that the date of the map is printed either at the top or the bottom, I forget which.

3879. (*Lieut.-Gen. Cooke.*) Of course, as has been said, there are great alterations in the numbering owing to alterations of parishes and alterations of the detail of the ground, but I suppose with all that a very large bulk of the maps of England remain with the original numbers; is not that your experience?—A very large number.

3880. In the country parishes, for instance, a very large number have not been altered?—The great bulk of the country is very little altered.

3881. And that would be a very strong argument in favour of not altering the present system, if possible?—Certainly.

3882. (*Chairman.*) But if the alterations on any sheet when it came under revision were not considerable, you would suggest keeping the same numbers, merely indicating any divisions by letters, such as No. 588 A. or B.?—I do not think if you publish a second edition it is important that the same numbers should be retained, provided that you fix the edition by the date on which it is published. With reference to the question which was asked by General Cooke, I should say that my experience, and it is a large one, is that the general surface of the country and the features on the

surface of the country alter, comparatively speaking, to a very small extent. In particular localities in the neighbourhood of towns, and in such a district, for instance, as Lancashire and Yorkshire, where there is a great deal of industry and the population is extremely active, the country does alter, but over the rural parts of the country the alteration is comparatively small. I may mention that the difficulties which were experienced from alterations in the features of the country by officers who used the 1-inch map was brought to my notice by Mr. Cardwell when Secretary of State for War, and they asked that a complete re-survey should be made at once of particular districts to suit the officers. I said that was not necessary, because the difficulties they found arose to a large extent from their not being able to read the maps and their not being able to detect a small alteration, and it arose from want of knowledge of maps, and in order to show that I asked the then Director of the School of Military Engineering to take up a square mile of the 1-inch map near Chatham and to have it surveyed, and it was perfectly astonishing the small amount of alteration there was, and I have had it tried moreover in one or two other cases, so that I am quite satisfied that over the great bulk of the country—the rural parts of the country—the alteration is comparatively small.

3883. That is on the 1-inch?—Yes, but in rural districts it would apply also to the large scale.

3884. (*Mr. Mather.*) On the 6-inch?—On that scale, the alteration is not large.

3885. (*Lieut.-Gen. Cooke.*) On all scales, except towns?—In all places, except towns. Where industry is very active then there are alterations, but taking the country as a whole the alteration is not very large. I may mention that I was comparing a short time back two parishes in which I am interested. I compared the tithe map and the Ordnance map which was made some considerable time after, and the alteration was, comparatively speaking, small. Those are two parishes in Norfolk.

3886. (*Chairman.*) I daresay that you have occasionally found that private properties are divided by other boundaries than those which are shown on the Ordnance map, by meres or stones?—That is frequently the case, especially in Kent.

3887. Is it desirable that the Ordnance Survey should take notice of those divisions?—No, I do not think it is desirable. I do not think the Ordnance Survey should take notice of property boundary. If they attempted to show undefined property boundaries they might commit various errors which might lead to very great inconvenience hereafter.

3888. How are you to use the maps for land registry purposes unless those boundaries are shown?—If the boundary is not upon the map my own feeling is that the surveyor should be sent to the locality to mark the boundaries, to survey them and mark them correctly.

3889. That would be a case where you would use the Ordnance Survey officer for the purpose of land registry?—Certainly, I may give an analogous case. It will be within the knowledge of the Committee that this Land Commission carried out the Extraordinary Tithe Act in which we valued the extraordinary tithe upon the lands cultivated with hops at a particular time. Of course, it was necessary to send a surveyor to the locality to fix the boundaries of the particular lands which were cultivated with hops, which may be compared to property boundaries. We could not possibly have valued the lands with out sending surveyors to the ground to mark the boundaries, and I do not think myself that it would be satisfactory to register land in the Land Registry offices without ascertaining the boundaries and properly marking them upon the Ordnance map.

3890. (*Chairman.*) Would sending those officers on the ground make a serious addition to the cost of conveyance?—No, not a serious addition. When the Land Registry was carried out under Lord Westbury, it was the invariable practice of this office to send a surveyor to the ground to take care that the boundaries were properly defined.

3891. Could you give us any information as to the cost incurred by doing that?—I forget for the moment, but I think the average cost was 16*l.* It was not a large cost; I should think generally under that.

3892. (*Lieut.-Gen. Cooke.*) What was the cost of the rest of the transaction. What proportion would 16*l.*

bear to the whole?—A very small proportion to the whole.

3893. A tenth or a twentieth?—I should not venture to express an opinion upon that.

3894. (*Chairman.*) Could you find out for us. Could you get one or two instances of that sort and allow us to have them on our notes?—I think it is quite possible that I can.

3895. In giving us that information it would be well to know the value of the property which cost 16*l.*?—I am sure that sum bore a very small proportion to the value of the property.

3896. At present the numbering on the Ordnance map is by parishes, and it has been suggested that it would be better that it should be numbered by sheets. What is your opinion upon that point?—My opinion is very strong that numbering by parishes is the proper thing. To make the maps available for purposes of reference you must quote the parish in which the number is situated. Sheet boundaries are imaginary lines. Nobody knows them but everybody knows the parish in which he resides or in which his property is, and you cannot refer to a property—at least, in my opinion, it would be very unsatisfactory to refer to it in deeds and other documents—as number so and so upon a particular sheet, as the bulk of the inhabitants would not know what the number of the sheet was, but I think you must refer to it by the recognised legal division, the parish.

3897. Have you noticed inconvenience arising from the numbering of the parishes being very irregular on the same sheet?—There has been, but I believe that irregularity has now been largely corrected.

3898. Do you know what that irregularity arises from?—I know it arises from the desire to publish particular sheets before the whole of the parishes are completed. I think it is of very great importance that the numbering should be by parishes, and that that inconvenience, which is a departmental inconvenience, should be set aside.

3899. Have you anything else you wish to tell us on the question of numbers?—No.

3900. Then we will go to the question of area books. When the 25-inch maps first began to come out area books were published, and the area books have taken two forms, one in which the nature of the piece of land numbered is mentioned and one in which it is not mentioned. Subsequently the area books have been abolished, and the areas have been stamped on the maps. Would you be good enough to give us your experience and views upon these points?—My first impression was that the area books would be the best. I was afraid that the area stamped on the maps would rather tend to confusion; but the stamping of the areas on the maps was adopted, and in our use of the maps afterwards we found it, I am bound to say, a very great convenience having a map with the area marked on each parcel of land, and it did not tend to confusion so much as I expected it would. I would therefore myself prefer stamping the areas on the maps.

3901. And you do not think it is desirable to continue area books in addition?—I do not think there is any necessity for continuing both, but it is quite clear that in some form or other summaries of the areas in each parish should be given, that is to say, area under cultivation, area under woods, area of water, area under roads, and so forth.

3902. How would you have that summary, in a book or on one of the sheets?—I should give it, I think, in a book, or on the index map of the county probably would be the better way to do it.

3903. On the index map you would put inside the area of each parish the quantities of which it is composed?—I should give a table on the index map.

3904. On the margin?—Yes.

3905. (*Mr. Mather.*) That would necessitate a fresh survey, would it not. Take the area of a road, for instance, running through a parish; if you wanted to put it down in the index book the area of the road itself would have to be measured specially, would it not?—No fresh survey would be necessary. In making up the area of a county or parish, the area of the roads would be measured and included.

3906. They are now recorded?—They are recorded now; it is merely making a summary of the total quantity of the roads in the parish, the total area of the

*Sir G. Leach,
K.C.B., R.E.*

14 June 1892.

Sir G. Leach,
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woods in a parish, and so forth, because it is important, for various statistical purposes, that the total area of wood and water, and so forth, and of the country roads, should be known.

3907. When the revision was undertaken those would, of course, be altered?—If you revise you must revise the areas as well as the maps themselves?

3908. (*Lieut.-Gen. Cooke.*) It has been stated by one or two witnesses that although it is very valuable to have the areas given on the face of the map as they are now, yet that the loss of the area book is a great loss because there is a great deal of information in it; there is information as to characteristics and information as to areas of different natures of land, and they have advocated that both should be given?—Of course if you give both it increases the cost and it is important to keep the cost as small as possible. I think you could give the characteristics equally as well on the index maps as you can in the area books; I think that the characteristics might be shown on the parish indexes. That is therefore no reason for continuing the publication of area books, provided, as I say, that you give summaries showing the total areas of the different classes of land and water and so forth in some form which may be considered best.

3909. (*Mr. Mather.*) You think publication of area books would be an unnecessary expense and might be dispensed with?—It does no harm, but it is an unnecessary expense, and I do not think they would be generally used. It is extremely useful to anyone using the numbers to have the area before him on the map.

3910. That seems indispensable for a good map?—That is indispensable for a good map. As I said I thought at first it might be inconvenient and lead to confusion, but it has not done so.

3911. (*Chairman.*) There is an index map of Leicestershire with the area of all the parishes on the margin. It has been objected that that makes the index map very bulky and of inconvenient size?—I cannot say that that makes the index inconveniently bulky, but in addition to the county index I am quite clear that there ought to be an index of each parish.

3912. If you have an index for each parish with only a recapitulation of the quantity of land of various classes it makes a very small slip; you could not publish it as a book. I put into your hand a county index map with a recapitulation for parishes?—That is what I mean.

3913. You would not have more than that stated.—I mean with reference to any one parish?—I think this table will be of great value.

3914. If you were to publish a book for a whole county with recapitulations for each parish it would not make a book of inconvenient size; do you think that would be the most suitable form in which to supply that information?—No; I do not think it is necessary to publish the book. I do not think it would be bought. I think very few people would purchase such a book.

3915. Then where would you put that recapitulation?—On this parish index.

3916. You could not get room for the recapitulation on the index map?—You have got the totals for the parish on the index; you do not want to repeat the information for every parish on each parish index, but you would give it for the whole county on the county index. The secretary has put into my hand one of the parish indexes, and I may say the index is prepared very much from suggestions which were made by myself. I think an index to each parish is necessary and that that index should give the specific information to which you refer.

3917. The recapitulation of particular counties in the parish?—Supposing I am a landowner dealing with land in the country I should be able to write to either the agent or to Southampton to say that I want sheets of a particular parish; send me down the parish index. Now, this parish index affords the information, and I think that that index should be made as complete as it is possible to make it. I think there must be an index for each parish, as well as an index for the county. The parish index may, if the number of parishes is not too great, contain three or four parishes. There is no reason whatever why they should not be combined, provided the parishes can be brought upon a sheet of a small size, say foolscap, like this index.

3918. (*Mr. Mather.*) You would have each index map to contain all the information that an index need give?—Certainly; the index of each parish.

3919. (*Lieut.-Gen. Cooke.*) Would you put on all the characteristic signs?—Yes, I think in each parish index. Then I would add further that I think the price of these parish indexes should be reduced to the very lowest possible limit. I am not sure I would not give them away, and they would give full information about the whole of the maps of that particular parish. The reason you require county indexes is because engineers very often, when they are dealing with large works, want to know the sheets over a whole county, and the number of small parish indexes would make it extremely inconvenient to have to use them, and therefore you require county indexes as well as parish indexes.

3920. Do not you think it is very necessary in an index like this, besides putting the fractional scale, to put in the number of the sheet?—I do.

3921. Then you would have distinct indexes for the 25-inch, the 6-inch, and the 1-inch?—I should have the parish index which would be for the 25-inch scale, I should have a county index for the 6-inch scale, and I should have a smaller index for the 1-inch scale.

3922. Do you think, in addition to that, it would be very desirable to have one index showing the 25-inch, the 6-inch, and the 1-inch all together, so that an engineer who is working over his country and sees a bit of ground on the 1-inch scale that he wants on a larger scale could see at once what number of the 25-inch sheet and of the 6-inch sheet he would find it on?—I see no reason whatever why each index should not show the sheets of all the maps, the 25-inch, the 6-inch, and the 1-inch.

3923. (*Chairman.*) That has been very strongly objected to by the map agents. They say that their customers have no knowledge of the subject and confuse all the numbers up together, and it leads to endless confusion?—That may be their opinion.

3924. That is with ignorant people you know?—I think it would be quite possible to show the different sheets on one index without confusion.

3925. But do not you think it would be better to have them separate as well as combined, and to have one for ignorant people and the other for informed people?—I think if it was properly done the mass of the people would very quickly understand it.

3926. (*Lieut.-Gen. Cooke.*) The map agents are very strong against that?—I think you might put a small map in the corner, and if the wording was simple—the great thing is to make the wording so simple that anybody can understand the index—I think then there would be no difficulty.

3927. (*Chairman.*) With regard to the detail on the maps, do you think it desirable to show trees to such an extent as they are now shown?—I think that greater labour is expended upon showing the trees in exact position than is necessary, but I think I would show the trees for this reason, that it makes the map a record of the class of country you are dealing with, the existence of trees on the map shows the character of the country; but with regard to other small details, I think they might very well be omitted. For instance, with regard to railways, the lines of rail are shown upon the map, and my feeling is that they are liable to constant alterations and are of no use to anybody. In the same way in small gardens in front of houses the flower-beds are shown and the little pathways round, and I think they might very well be omitted.

3928. (*Lieut.-Gen. Cooke.*) From the 25-inch as well as the others?—On all the maps, I think.

3929. (*Chairman.*) In your Irish map, the first 6-inch map, did you show trees?—Yes.

3930. (*Mr. Roby.*) Conventionally, or actual trees *in situ*?—We showed where the trees were; we did not fix trees in correct position; but if there were trees along hedgerows, they were shown conventionally, and I think that is of great value, and I am speaking now as the result of considerable experience. For instance, in dealing with land under the Land Commission, we found it of great value to be able to get the Ordnance map with the contours upon it, and with all the details. They showed us very clearly what the character of the country was. If we were making an exchange between two properties it assisted us to judge whether the exchange was a fair and proper one. We derived certainly very great benefit from the Ordnance maps.

3931. (*Chairman.*) Supposing you have a bush in a fence, that is shown in the Ordnance map as present

by exactly the same mark as an important oak tree?—We could not, of course, be guided by the map in a question of trees and so on; that would depend upon the valuation, but it would give us a very good idea of what the class of country was, and the contours would equally tell us what the aspect of the country was, and what the altitude was, and these are all considerations in dealing with property; therefore I should be sorry to see the trees omitted.

3932. At the Surveyors' Institute, in 1882, the president, in summing up the discussion, observed that in the whole the balance of opinion seemed to be in favour of the omission of the larger timber, and so far as the evidence before us is concerned I think the balance of evidence is against the putting in of hedgerow timber, on the ground that it obscures the boundary line and makes it difficult of erasure and correction?—I think if you yourselves examine the maps, you will find that the boundary lines are perfectly clear notwithstanding the trees.

3933. Your opinion differs from that of these other gentlemen?—My opinion differs from theirs.

3934. (*Lieut.-Gen. Cooke.*) Here is a case where you would think they would be better omitted (*referring to map of Abvaston and Boulton*)?—That is in towns. I think in towns, in villages and so forth, to crowd the map with trees is a mistake which might be avoided without interfering with the general principle.

3935. (*Chairman.*) In fact, you think the trees should be rather at the discretion of the Survey Department?—I do.

3936. And it should not be taken that the absence of trees means that there are none at all?—Certainly not.

3937. (*Lieut.-Gen. Cooke.*) As a sort of guiding rule, you would put them in hedgerows and so on, but you would avoid them where they interfere with villages?—Yes.

3938. (*Chairman.*) Do you agree with Mr. Edward Ryde in the following passage (*discussion at Surveyors' Institution*): "The balance of opinion appeared to be in favour of the omission of hedgerow timber. The question as to what an owner would think of a plan which did not show timber might be answered by asking what would an owner be likely to think of a plan which showed timber that had long ceased to exist, for when once the trees were printed on the maps it was, as Mr. Leane had pointed out, extremely difficult to efface them"?—I was present at the meeting at the Surveyors' Institution. Each person naturally spoke according to the particular purposes for which he had used the maps; but taking a broad general view, I should have the trees marked, because they show the character of the country.

3939. Complaint has been made that inconvenience is suffered because the maps will not join by reason of the numerous meridians. Have you found any such objection?—Formerly when the large-scale maps were first introduced they were considered to be parish maps, county maps, or general maps of the country.

3940. (*Lieut.-Gen. Cooke.*) The 6-inch map are you talking of now?—No, the 1/2500 map. The 1/2500 map was accordingly published by parishes. It was very soon found that it was exceedingly difficult to join the 1/2500 maps which were published separately by parishes in consequence of the irregular character of the boundaries of the parishes. I remember pressing this very strongly upon the then Director of the Survey, Sir Henry James, and it was subsequently altered, it being very much easier to join sheets by straight boundaries, such as the sheet lines, than it was to join them by the parish boundaries. Now, I think that that applies to the maps of the whole country, and where it can be done without serious error the fewer meridians you have the better. Of that I think there can be doubt whatever. Then in the case of the 6-inch maps I should have the sheet full and extending over the county boundaries where it can satisfactorily be done.

3941. (*Chairman.*) The sheets are full now, I believe?—I believe they are.

3942. They are filled up to the meridian no doubt on which the mass of the sheet is surveyed; then you arrive at the adjoining county which is surveyed on a different meridian, and which is also filled-up on a different meridian, and it is suggested that these sheets will not join. We have evidence on both sides of that question?—I presume they will not join by the sheet

lines, but you can join them by the detail upon the maps, but there is no doubt that it is an inconvenience, and it is very desirable that the number of meridians should be as small as possible.

3943. Still there must be meridians?—Yes.

3944. (*Lieut.-Gen. Cooke.*) You must have the whole of one county mapped on the same meridian, because if you did not when you came to join the sheets you would not have them square to the edge if you wanted to mount them?—No; but you might probably make a number of counties on the same meridian—several, where there are small counties.

3945. (*Chairman.*) Would you suggest that on revision the meridians be all changed so as to reduce the number, and making long strips of England running north and south to be on the same meridian?—Well, I should hardly like to express an opinion on that point without going into it more carefully to see what could be done, but I would lay down the general principle that the meridians should be as few as possible. There might be other reasons in the consideration of the matter which would make it objectionable to alter the meridians or to alter the maps as they now exist.

3946. It would probably involve the re-drawing of the maps to change the meridians?—It might involve the re-drawing of the maps.

3947. I pass now to the question of the revision of the town plans. Has your attention been drawn to the large town plans, the 10-feet plans?—No; it has not specially. The revision of the town plans should of course take place as part of the general revision of the country.

3948. It has been suggested that some co-operation enforced by law should take place between municipal authorities and county authorities and the Ordnance Survey, so that the Ordnance Survey shall be informed of the alterations that are taking place, and that that would greatly facilitate revision, and enable it to be done much more frequently and much more effectually?—I am afraid that that would not be practicable. Supposing, for instance, that a borough surveyor informed the Ordnance Survey that a new street was laid out in a particular town what advantage would that be to the Ordnance Survey unless there was to be a continuous revision, which, I am afraid, is impracticable on account of the expense.

3949. Is that so?—I am afraid that continuous revision is impracticable, because you must have your men all over the country; but what is much more practicable, and what has been urged in very many directions, and what has been urged from this Department upon the Treasury is that the maps should be revised periodically, and of course that means a question of money; but I think there is no greater question or a question of more importance before the Committee than that there should be a periodical revision. It is well known to the Committee that some of the maps are extremely old, this is the most economical course which could be pursued, because if the survey was too long without revision, the ultimate cost of revision is largely increased, especially in populous localities; and what has been advocated by the Board of Agriculture has been that the survey of the whole country should be brought up as rapidly as possible to its proper normal condition, and then that it should be properly revised every 15 years.

3950. Let me take you by steps. As regards the 1-inch map, you have already said that the amount of revision required to keep that in order is small?—The amount of revision would not be the same on the 1-inch map as on the larger maps.

3951. There is so much less detail?—Yes; but still it will require a considerable amount of revision about the towns, and where there was great progress of any particular industry in the country considerable alteration would be required, and of course the 1-inch map must be revised equally with the other maps. What I meant was that in the rural parts of the country the alterations which take place are not so large as is very often supposed.

3952. Would it be well to separate the revision of the 1-inch map entirely from that of the large-scale maps?—No; I think the two must proceed *pari passu*, and I hope that means will be found of publishing the 1-inch map at a much less cost than it has been done hitherto.

3953. At the present moment the new 1-inch map is a reduction of the large-scale maps?—That is so.

Sir G. Leach,
K.C.B., R.E.

14 June 1892.

*Sir G. Leach,
K.C.B., R.E.*

14 June 1892.

3954. And you think that in revision it must still continue to be a reduction of the revised large-scale maps?—Certainly.

3955. Does not that prevent us having a 1-inch map in good condition?—No; I think not. I hope that the process of zincography may be brought to such perfection that they may publish the 1-inch map by zincography as well as the other maps. They do so abroad in the case of some of the maps. For example, in Switzerland, the maps which are analogous to the 1-inch maps of this country, are produced, I believe, by lithography, and are very beautiful maps indeed, and I can see no reason why the same principle should not be followed in this country. It is of course as important to those travellers who use the 1-inch map that the 1-inch map should be accurate as it is to those who use the larger scale maps that they should be accurate.

3956. Is the 1-inch map of any service in a large and populous neighbourhood apart from showing the leading roads which run into that populous neighbourhood?—It is of value and a necessity as part of the general geographical map of the country.

3957. And those leading roads do not change?—Those leading roads, as a rule, do not change in rural districts.

3958. Therefore the revision of the 1-inch map in a growing and populous neighbourhood is simply limited, you may say, to extending the black marks between the roads indicating houses?—No doubt it is important that the 1-inch map should show where there has been any large extension of towns and actual alterations, such as railways and works and improvements of that kind; and therefore you must revise the 1-inch map as well as the other maps.

3959. The point I was putting to you was that the two revisions should be kept apart from each other. The revision of our old 1-inch map has been delayed, and it has got very much out of date owing to the intention to found that map on the large-scale map, it not having a survey of its own?—I think perhaps I might put it in this way, that the revision of the larger scale maps is more important than the revision of the 1-inch map. I think that there can be no doubt about that.

3960. You know that town plans have to be deposited with the local authority showing the nature of the building alterations which are in course of construction in that town?—Yes.

3961. Is there any reason why the local authority should not send once a year to Southampton copies or tracings of those alterations which have been effected as shown by these plans indicating them on the Ordnance sheet?—No reason whatever.

3962. Would it not simplify revision very much if the Ordnance Survey receiving these sheets were then to send a person over the ground to check them, and they being so checked to adopt them as their survey?—If the plans were sufficiently accurate (which experience would show) it might be of use; but I confess I was not aware that in all large towns accurate plans were required to be produced of all alterations to buildings. If that is the case and those plans are reliable they might be of value.

3963. (*Mr. Mather.*) That is universally the case now?—Then they might be of value.

3964. (*Chairman.*) Of course that would not apply to the case of a rural sanitary district which happens to be growing in population?—No.

3965. But at the same time even there a new road before it is accepted by public authority would have to be shown?—Yes.

3966. And to that extent, but not quite so perfectly; such plans might also be sent to Southampton?—Certainly. The only observation which I think it necessary to make would be that it would not be safe to put upon the Ordnance maps, the necessity for accuracy being paramount, any information which had not been checked by the Ordnance surveyors.

3967. I think I mentioned before that the Ordnance surveyors should send their examiners to check those plans, and being satisfied with them should then put them on their surveys!—Quite so; experience would show whether those plans were such as could be used for the purpose.

3968. That would introduce a system of continuous revision if it were practicable?—No doubt it would

enable a continuous revision to be made at less expense, but of course you will have to produce new plans, new publications, and that would be a considerable expense.

3969. (*Mr. Mather.*) New editions of maps?—New editions of maps. If you make any alterations you will have to condemn all the maps which have been printed in the previous edition and publish a new edition. If you revised the maps you could not issue to any one of the public a map of the old edition; you would be obliged to give him the new edition.

3970. (*Chairman.*) A town map on a 10-foot scale to be of any service must be accurate?—No doubt a town map to be of any service must be an accurate map, but it might be of great value, though alterations had been made, because such alteration as was necessary could easily be made by anyone on an accurate basis.

3971. Being on so large a scale it rapidly becomes obsolete?—No doubt that is the case when the map is extended to the suburbs of towns not built over.

3972. Do you think revision once in 15 years would be sufficient for a town map?—Of course a revision more frequently would be of importance, but I am looking at the question of expense, and my own feeling would be that revision once in 15 years would be sufficient for all practical purposes.

3973. We will take that district of Chelsea about Cadogan Place. The 5-foot map of London of that district must now be quite obsolete?—No doubt; that is the 5-foot map which was made a considerable number of years ago.

3974. That is the town map for that district. Would it be unreasonable, in your opinion, considering that the utility of that map is entirely for municipal purposes, that a charge should be upon the municipality for the purpose of keeping that map correct?—As to charging the cost upon the municipality I think the municipalities in a good many cases would object to pay, but if they were willing to pay I see no reason whatever why it should not be done. In point of fact that is being done already in some of the towns in the north of England, that is to say, the extent covered by the large-scale maps has been materially increased upon payment by the municipalities for the expense incurred in making that extension.

3975. Considering the great services to the municipality rendered by the State in obtaining this map is it unreasonable that they should pay something towards the cost?—No, certainly not, if revision is undertaken for their special benefit.

3976. They have had up to the present time their towns surveyed gratuitously, but the survey so made rapidly becomes obsolete?—Yes, to a certain extent.

3977. And in order to maintain it in a state of usefulness a very large and continuous outlay is requisite?—Yes. The borough surveyor must keep the map up to date for municipal purposes. It would save cost if this was done by the Government.

3978. Is a charge of so local a character a legitimate charge on the State?—I think the expense might properly be charged to the towns just in the same way as they have paid for an extension of the area of the large-scale maps where they considered they would be necessary, but where the land was not covered with buildings the maps must necessarily become obsolete in a very short time.

3979. No works of drainage or of building or any class of alterations can be carried out in a town without a town map?—Certainly not.

3980. And if the Ordnance map becomes obsolete it puts a necessity on the town of having a new survey of its own?—It puts a necessity upon the town of revising the Ordnance map so far as is necessary for their purposes of drainage and water supply.

3981. And as they are under the necessity of doing that themselves might not the State revise its own map for their convenience more promptly than it does at present, they bearing a large part of the cost?—I think so, certainly.

3982. (*Mr. Mather.*) Do the 10-foot scale maps of towns properly belong to the Ordnance Department or should they in the future?—I think they ought to be published by the Department, at all events in the first instance, and also be periodically revised.

3983. They have been published by the Department in the first instance already. The district is surveyed and a town is shown, but I think you have not perhaps

quite carried the idea far enough. Scores of towns we may say almost hundreds of towns in this country in 15 years change their conditions altogether. A map on the 10-foot scale in 15 years would be practically worthless looking to the extensions that are now taking place. Owing to the rate at which we are living and the increase of population you can scarcely think of a town, unless it be an old cathedral town, which is not extending at such a speed that 15 year's interval between the dates of map, would be sufficient to render the maps almost worthless as they came out?—I think the better principle to be adopted would be that the town maps like the maps of the whole country shall be revised once in 15 years, but if a town wishes that its map shall be revised more frequently then the municipality must pay for it, I think that would be a very intelligible principle to adopt; and the towns would say, "We will facilitate the revision by giving you plans of the alterations which have taken place, and we will therefore in that way lessen the expense, and in order that we may have our town plans made complete more frequently than at intervals of 15 years we are willing to bear the expense."

3984. Would you say, looking to the fact that the 25-inch scale map is the standard map for the whole country, from which all other maps are to be produced in future, and upon which, of course, towns are shown in very considerable detail in regard to streets and plots of land, and so on, would it not be sufficient if that 25-inch map were revised, say, every five years by the Ordnance Department, and if all the maps on the 10-foot scale necessary for municipal purposes and local government purposes were revised from time to time entirely by the local authorities. At the present time it is an enormous labour to the Department. It takes a very large staff even to meet these requirements of the town authorities. Would it not be better to throw upon the town authorities themselves the whole of the work?—That is to say, to sweep the towns out of the list of the Ordnance maps.

3985. The towns on the 10-foot scale?—If the Ordnance make the surveys and revise them upon the 1/2500 scale it would be far better that they should revise upon the larger scale and reduce to the 1/2500, and that would save the towns considerable expense. You said revise every five years; do you mean five years or 15 years.

3986. Every five years the 25-inch map of the whole kingdom, and publish a fresh edition every five years, and make that the only work of the Ordnance Survey Department, so far as a large-scale map is concerned?—No doubt the more frequently you can revise the maps the more convenient it would be and the better for those who have to use them, but it is a question of expense.

3987. Leave out expense altogether for the moment in order to discuss a perfect map for the country?—To make the most perfect map of course you would put in every alteration of the country as it occurred, but the expense would not admit of it. It would be ideal perfection, but is not practically necessary.

3988. (Lieut.-Gen. Cooke.) If, as Mr. Mather suggests, the Ordnance Survey were to undertake the 25-inch revision, nearly everything that they did would be almost practically useless for the revision of the 10-foot map, would it not?—It would if it was merely revised upon the 25-inch scale.

3989. The revision of the 25-inch would not help the revision of the 10-foot, and the whole of the revision of the 10-foot would be thrown on the towns, whereas if they gave money and the Ordnance Survey revised the 10-foot and the 25-inch together, it would be possible to revise both at a very much smaller cost?—Certainly.

3990. If the responsibility of this revision rested entirely upon the towns, instead of on the Department, you would have money furnished you by the authorities for the 10-foot scale map from time to time, and the Department would simply act as the expert producers of the map?—That would meet my views.

3991. (Mr. Roby.) You mean that as regards the departmental work, in principle they would do nothing on a larger scale than the 25-inch?—Quite so, if the principle alluded to was carried out.

3992. But they would be willing to work by the job as it were on the 10-foot scale?—Quite so; and that expense to be borne by the authorities. There is no reason why the authorities should not bear the expense of the town surveys if they are willing to do so, but my

impression is that the whole should be revised, as I say, periodically, once in 15 years. I think that is a good period to be fixed. If the towns require more frequent revision they should pay for it; I think that also is a good principle to lay down.

3993. How would this do—that the revision at the Ordnance Office should be continuous, acting so far as they can upon the plans sent to them from the localities, and verified by their own examiners, but that the publication should only take place every 15 years, the towns having the opportunity in the interval of getting revised copies on payment?—You see your difficulty would be this. A new street is laid out in a town; is a map to be condemned because a new street is laid out; what extent of alteration should require re-publication.

3994. Do not you intend in your proposal to republish every 15 years?—Yes, to republish every 15 years.

3995. But the locality should be able at intermediate period to obtain a map authorised by the Ordnance Survey Department?—If they pay for it.

3996. (Chairman.) With regard to contours are there sufficient levels marked on the town maps?—I am not able to answer that question, because I have not gone into it.

3997. As regards the other maps then, the 6-inch maps?—As regards the other maps I am strongly of opinion that there are not enough contours to show the ground with sufficient accuracy for the purpose of engineers.

3998. Was the contouring of the original maps of Lancashire and Yorkshire sufficient?—Yes, quite. That was contouring, I believe, at close intervals of 50 feet or 100 feet.

3999. (Mr. Roby.) You do not require more instrumental contours do you than there are at present. You would be content with something less accurate than that?—I may mention that I was one of the first officers sent to test whether the contouring could be carried out at reasonable cost, and then I had to consider all these questions and I satisfied myself that the vertical interval between the contours ought not to rule but the horizontal interval, that is to say, that if I take up any map, say the 6-inch map, assuming that I am an engineer laying out a railway, I ought to have on the map contours wherever I walk within, say, an average distance of about 200 yards; that is to say, that the contours should be horizontally not further apart than a quarter of a mile. The vertical interval between the contours must vary according to the character of the county. In Lincolnshire you require to have the contours vertically very close together, because the county is very flat; if you go into a steep county you do not require so many contours. For instance, with steep slopes the contours may represent a considerable vertical interval, because you have them close together, horizontally, that is to say, on the map; but if the slope is very slight you require to have the contours at very close vertical intervals, so that they may not be too far apart on the map.

4000. (Chairman.) Have you tried making a map on these principles?—That was the principle I carried out in Ireland. When I was engaged in contouring the north of Ireland I used interpolated contours to represent flat parts of the country.

4001. Is that map published?—That map is published. The contours were interpolated so as to cover the map with contours at certain intervals, and that practically accomplished all that was wanted.

4002. You use the word interpolated contours. Do not you mean instrumental by interpolated?—I should explain that in using the word interpolated we fixed on certain contours which were run over the whole county. For instance, a 50-foot contour was run over the whole county, 100 feet, 200 feet, 300 feet and so forth; but if the ground between the 200 feet and the 300 feet was flat we interpolated a contour at 250 feet.

4003. (Mr. Roby.) You interpolated them specially where the ground was flat and not where the ground was rising?—Just so; I found from experience that if you take the centre between any two contours you will find that the level is a near approximation to the half interval between the two contours, so that practically an engineer could lay out any work upon a map contoured, as I have pointed out, with contours of not more than a quarter of a mile apart on the map; but I do not think that any amount of contouring would

Sir G. Leach,
K.C.B., R.E.

14 June 1892.

*Sir G. Leach,
K.C.B., R.E.*

14 June 1892.

prevent the necessity for special surveys. If I am laying out a railway I must first of all lay out the line which I could do with contours at these horizontal distances apart, and then I must make my special survey to calculate my cuttings and fittings.

4004. (*Chairman.*) Is that contoured work very costly?—It cost then about 1*l.* per square mile, which was a very moderate cost.

4005. (*Mr. Mather.*) I might mention that Mr. Cooper, the engineer of the new Lancashire, Derbyshire, and East Coast Railway, stated to us that the 6-inch map was so perfectly contoured for his engineering railway purposes that he was able to lay down and find the best gradients for this line right across the country from that map?—Quite possibly in countries of that character the contours are sufficiently close to enable him to do so.

4006. There are 25-feet contours in many parts of Derbyshire?—I can only tell you that when Mr. Vignoles had to lay out a railway in Kilkenny, he came to my office and asked to see the contoured maps, and we put them before him, and he laid out his railway without going on to the ground at all from the contours; he had a sufficient number of contours to enable him to do so. They were within a quarter of a mile of each other horizontally on the map. But having laid out the railway, he had to make a special survey for his cuttings and gradients.

4007. (*Mr. Roby.*) That was the 6-inch map?—That was our 6-inch map.

4008. (*Chairman.*) Sir Charles Wilson told us that instrumental contours cost from 1*s.* to 1*l.* per mile run to survey?—Well, that is a high cost. I should not have expected it to be so much; but then he may possibly have included the cost of the levelling and other expenses which I did not include, and the price of labour has greatly increased both in Ireland and elsewhere since that time.

4009. (*Lieut.-Gen. Cooke.*) 1*l.* per square mile would allow only one line through a square mile according to Sir Charles Wilson?—We used to calculate about 6 linear miles to 1 square mile.

4010. (*Chairman.*) The levelling is surely an essential part of the contouring cost?—The levelling is of course an essential part, but when I said 1*l.* per square mile I merely took the actual cost of running the contour lines. Probably I may not have explained sufficiently what I mean by the levelling. The first thing necessary is to run levels up and down the country, so as to give starting points for the contours, and then having got a starting point you level the contour line until you come to another point, the altitude of which has been fixed. And in specifying 1*l.* per square mile I was merely referring to the running of the contour lines.

4011. You think that would be a justifiable expenditure to incur, and that our present 6-inch map would be proportionately improved by doing it?—I think it would be a very great improvement to the 6-inch maps and to all the maps that the number of contours should be sufficient. General Cooke will remember that I pressed this very strongly when the survey was in progress, but it was more important at that time to finish the maps rather than to extend the contours. This may be said of the contour lines, they require no revision; once done they are done for ever, and that is a very important point when considering the question of expense; and it certainly is important that they should be sufficiently complete to enable engineering works to be carried out without having to do more than make the special surveys necessary in all cases for carrying out works.

4012. (*Mr. Mather.*) Are you aware that a great number of maps have been published by the Department on the 6-inch scale without contours at all?—The first edition was brought out without contours because the contours were not ready, but I believe they have now published, or are publishing, all the maps with contours.

4013. Do you think it would be highly injurious to the reputation of the Department, and to the interest of the public, to continue to issue that uncountoured edition of the 6-inch map?—No, I think it is desirable to publish the 6-inch map as soon as possible after the surveys are made, although the contours may not be then ready, because they can publish a second edition as soon as the contours are ready.

4014. The facts of the case are now that the contours are ready and are being published. A new edition has

been issued of the 6-inch scale map with contours. The old uncountoured maps are in existence. Do not you think it would be injurious to the public to sell these sheets under that circumstance of the new edition being issued?—Certainly. I think when a new edition is published the old edition should be condemned.

4015. Are you aware that the Department has instructed its agents to sell the old sheets as damaged goods at 8*d.* per sheet instead of 1*s.*?—No, but I can see no reason why that should not be done if the public are willing to have them, and do not want the contours; it is giving them a cheaper article, and not selling damaged goods.

4016. Would you consider it creditable on the part of the Government to have two editions, one a correct and proper edition, and another an incorrect edition sold at a lower price?—I should rather say, not an incorrect edition, but an incomplete edition.

4017. But in one sense an incorrect edition?—I should consider the Department fully entitled to offer an uncountoured map to myself. For instance, I might want a map for a particular purpose, and I do not want the contours, so I say to the agent, "Can you give me the 'maps at a cheaper price without the contours?'" I should say that the agent of the Department would be perfectly justified in selling me a map without the contours if I wished for it, but not in selling me a 6-inch map as a complete map without the contours when the contours are published.

4018. But the difficulty of the agent is this, that having all this old stock he has got to get rid of it at this reduced price, and therefore he is stopping the sale, and stopping the publication of the only map that the public really cares for, which is the contoured and complete 6-inch scale map?—The agent ought to say to his customer that he can have either: "There is the apple," and there is the orange, you can have which you like; "but the price of the apple is 3*d.* and the price of the orange is 6*d.*"

4019. (*Lieut.-Gen. Cooke.*) It is something like selling the plan coloured or uncoloured?—Yes.

4020. (*Chairman.*) With regard to contours, do you think that as now published they obscure the map; might it not be better to publish the contours in colours?—I think the contours, especially on the 1-inch scale, are not sufficiently marked; they are published too light, and whether the best way would be to publish them in colours, or rather darker in black, is a question which should be disposed of by experiments so as to see which is liked the best.

4021. You would give the same answer with regard to the 6-inch?—I should give the same answer precisely with regard to the 6-inch.

4022. But has it not struck you that it would be better to publish them in colour?—Probably it would be better to publish them in colour, but I should like to see it tried.

4023. Have you seen any specimens?—I have not seen any specimens of it; but I think they should be printed sufficiently heavy to be quite clear on the map and traceable. (*A map of Brighton with contours printed in red was handed to the witness.*) I am not myself fond of too much colour upon maps, and I think the contours would look better and more artistic if the contours were printed in black in preference to red. I should be disposed to try brown or a neutral tint. I think the red is rather confusing.

4024. But at the present moment may not a contour line be taken for a footpath?—I think not if properly printed.

4025. But at the present time—as they are now printed?—Yes; I think they are not quite printed as they should be at the present time; but it must never be supposed that contours will convey to the eye the form of the ground as shading does. The contours require to be studied just in the same way that any other part of the map does; they are not a picture any more than the analogous pattern lines on a marine chart.

4026. At present the contours stop at 1,000 feet. The system now is to have a contour line for the first 500 feet, and then for every 100 feet up to 1,000 feet, and nothing afterwards?—I think the vertical intervals should now be fixed. The intervals should be fixed for certain leading contours, but the Ordnance authorities should interpolate contours between the fixed contours where necessary to figure, comparatively speaking, flat areas.

4027. (*Lieut.-Gen. Cooke.*) Would you have the leading contours what they are now on the Ordnance Survey plans, and interpolate between them?—I do not know exactly what they are.

4028. The contour lines are fixed at 50 feet, and at every 100 feet up to 1,000 feet, and then cease?—You must have the hundreds, and I have no doubt that in parts of the country additional contours would be necessary properly to represent the ground, and to carry out the principle I have previously expressed.

4029. (*Chairman.*) And you would interpolate others so as to accord with your theory?—Yes; when I had to consider and arrange the matter myself in Ireland I adopted the duodecimal scale, that is to say, the maximum interval was 400 feet, and then I divided it down to 200 feet, and divided the 200 feet again into 100 feet, and the 100 feet into 50 feet, and the 50 feet into 25 feet, and for towns where the country was very flat down to 5 feet.

4030. (*Lieut.-Gen. Cooke.*) What would you think should be the leading contours after 1,000 feet?—The leading contours after 1,000 feet were generally at 1,200 feet, and 1,400 feet up to 1,600 feet, and above 1,600 feet a 400 feet interval. It depended entirely upon the character of the ground.

4031. (*Mr. Roby.*) And that you still approve of?—That I still approve of.

4032. (*Chairman.*) Have you any other observations to make on the style of our maps?—I think it is very important that a considerable number of figures—the altitude figures—should be put along the contours, and that one mode of engraving those figures should be adopted, that is to say, that they should always be put upon the upper side of the contour; then they show at a glance the direction of the slope, and if the figures are put in lines they are very easily followed. I am not quite sure whether it is always followed at the present time, but it certainly is important.

4033. (*Lieut.-Gen. Cooke.*) Would you put altitudes on the highest points on the 1-inch map even where there are no very high hills. Take the Brighton range for instance?—Certainly; where there are altitudes that had been found I should put them upon the different heights and indicate the gaps or passes between the different hills (*engraved maps of Portsmouth and the Isle of Wight printed in black and brown were handed to the witness.*) I think something between these two maps would be better as regards tint, making the brown a little more neutral tint. The brown is a very pretty map and obscures the detail to a very small extent.

4034. (*Chairman.*) You rather prefer the brown map to the black map?—I prefer the brown map to the black map. (*A photo-zincographed map of the Isle of Wight printed in colours was handed to the witness.*) This strikes me as having too many colours.

4035. You rather prefer our maps as hitherto produced to a map printed in colours?—I see the roads here are printed in colours. I do not like that.

4036. And the woods are shown in green and the water in blue?—Yes; there are a good many contours here. This is, I conclude, taken from one of the French maps. They print in colours, but I never like that. I prefer very much this specimen (*Portsmouth and the Isle of Wight*) with the details printed in black and the hills in brown. Of course printing the water in blue makes it look much prettier, but so far as use is concerned the water black, is equally good, and it saves a separate printing.

4037. (*Lieut.-Gen. Cooke.*) I should like you to look at that map (*hill-shaded map of Argyllshire*) and to say whether you could produce with brown the same impression that is produced in that way?—I think as a work of art I should prefer the black, but for use I prefer the hills in a neutral tint.

4038. (*Chairman.*) Do you consider that the *carte vicinale* is a superior map to ours?—Certainly not; it is not as clear and is not so artistic, and I do not think it is more useful.

4039. It has a great many details marked on it that are not on our map?—It has a great number of names, but they are so very small without very good sight none can read them.

4040. (*Mr. Roby.*) There is a great deal more distinction made as regards the different classes of roads than there is on our maps?—I think it is of very great importance that in our 1-inch map all the roads upon

which you can drive and which may be called good roads should be, so far as possible, distinguished. I think that is hardly sufficiently done—that it might be improved.

4041. (*Chairman.*) Is not that intended to be done with our new maps?—It is, I believe, intended to be done, but it is hardly done sufficiently clearly in some of the maps.

4042. (*Lieut.-Gen. Cooke.*) It seems to me that it is almost impossible in practice to keep up the difference which is shown between the first and second class roads?—It is very difficult.

4043. (*Chairman.*) Do you think that the two first classes of roads, as shown on the sheet of characteristics, should be merged and only the distinction shown as between them and third class?—I think so, and that a good metal road should be shown as a road which you can drive and travel along without any difficulty from place to place.

4044. (*Mr. Roby.*) Your distinction between first and second class roads would relate rather to the roads themselves than to the legal point as to who was bound to repair them?—It would; it would apply to their being a carriage road. I think in this sheet of characteristics the distinction is too fine to be appreciated by the public.

4045. (*Chairman.*) As between three classes of roads?—Yes.

4046. You would reduce them to two?—Yes.

4047. (*Lieut.-Gen. Cooke.*) You have had a very large number of Ordnance Survey maps passing through your hands; how have you found them as regards accuracy taking the whole of the Ordnance Survey?—I should have no hesitation whatever in saying that, so far as anything can be accurate, they are accurate, and that the number of errors is infinitesimally small.

4048. Do you think that any maps should be published on thin paper; do you know of any particular purpose to which thin paper editions would be applicable and desirable?—I do not think I should publish on different qualities of paper. I think the paper upon which the 6-inch impressions are lithographed is too soft a paper for practical use, and I should be very glad if they could be printed upon a harder paper; but I understand there is a difficulty in lithographing or zincographing upon the harder paper. There is another point connected with the 6-inch map, which I think would be worthy of notice if it could be done. The 6-inch map is a more general map than the large-scale map, and is issued generally for purposes where you want to have a large area of country in view at the same time, and if it could be done it would be desirable to print the 6-inch map in the large sheets instead of in the quarter sheets; how far it would be practicable I do not know.

4049. (*Mr. Roby.*) Those are three copies of the same 1-inch map (Cambridge) on different kinds of paper?—This is a very excellent map printed from zinc. That map I should consider sufficiently good for all purposes. I should prefer the thicker paper to the thinner. One of these is engraved on ordinary paper, and the other two are printed by transfer from the zinc. The change in the method of printing from engraving to zincography would reduce the price by about half, but the paper being soft no one can write on it or make a mark upon it without its blotting.

4050. You think the paper should be one on which people could write with ink?—Yes, on the paper on which the engraved map is printed you can do that.

4051. (*Mr. Mather.*) Will you look at that 1-inch map (Barnstaple) and compare it with the sheet you praised so much as being perfect for all practical purposes. That is zincographed by transfer from the copper and this is photo zincographed from the map itself?—There cannot be any doubt whatever that the zincograph from the copper is better than the photo-zincograph.

4052. Would you consider this an inferior map altogether below what the Department ought to produce for general purposes?—I think it very desirable that they should produce a superior quality of map, but there are certain conditions which have to be taken into account and one is rapidity of publication. The Board of Agriculture understood from the Director of the Survey that the 1-inch map engraved with hills could not be completed until 1925. The Board considered, and I think rightly considered, that that was too long a period and that some process must be adopted

Sir G. Leach
K.C.B., R.E.

14 June 18

Sir G. Leach,
K.C.B., R.E.

4 June 1892.

by which a map could be more readily produced, and therefore, the Board represented to the Treasury that it was desirable that an advanced edition should be produced by photo-zincography for the sake of rapidity.

4053. But you would not adopt that process, would you, for the future after the survey has been completed and the Department has got up to date with its work. You would not recommend photo-zincography as a process by which you could produce the 1-inch maps?—I should recommend that for the first edition because of its rapidity, but I would not certainly recommend that the engraved map should be done away with. It would be practicable to revise the 1-inch map, although engraved, with great facility. I dare say the Committee have been or will go to Southampton—you have seen that a copper matrix is taken by the electrotype process which has everything raised upon it instead of the lines being depressed in the copper as it is engraved. That gives you very great facilities for alteration; all you have to do is to scrape away what is raised and to re-engrave what you want to substitute, and that gives very great facilities for revision, and therefore, I think, although it is desirable to produce a map with the greatest rapidity which is practicable, I certainly should not do away with the engraved map, which is a beautiful and artistic work.

4054. You would recommend that the Department should continue to prepare for the production of maps for the future from copper-plates?—Yes. I should like to make one remark with regard to paper before we pass from that subject. It is of great importance that the maps always should be printed upon the same quality of paper.

4055. (Chairman.) Always?—Always; experiments should be made to obtain the best quality of paper for printing the maps, and they should be continued to be printed upon that quality of paper, otherwise if you print upon varying qualities of paper and you require different maps to be mounted you sometimes get a paper of one quality and sometimes another. The agents have complained of that, and of course it is very important when you mount maps together that they should be on the same description of paper.

4056. Would you publish editions on different sorts of paper, separate editions, so as to suit different purchasers, as, for instance, on this thick paper and thin paper?—No. I think the thick paper would meet all purposes; if you print on different papers you multiply the number of maps so largely that it becomes extremely inconvenient.

4057. Do you know the Ordnance map of which there has been some talk lately—4 miles to the inch?—It has only recently come out and I cannot say that I have examined it with the care which would enable me to express any opinion upon it to the Committee.

4058. (Chairman.) Is it desirable that the Ordnance Survey should publish a map on that scale?—Yes, I think it is desirable that they should publish a map on that scale. But it has been asserted that this map does not represent the country as it now is because in many cases the sheets are of very considerable age; but I think that it would be desirable that such a map should be published when the Survey is brought up to its proper state. I have not gone into the criticisms which have been made upon the map because I do not know sufficiently the country. I confess I look upon them with some doubt; I think that small things have been magnified into mountains, and I can hardly believe that the map is so deficient as it has been said to be.

4059. (Lieut.-Gen. Cooke.) Do not you think it would be rather interfering with trade for the Ordnance Survey Department to go below the 1-inch; do not you think it would be better to leave the trade to supply what the public want below that?—I am very much guided by what has been found to be useful in Ireland. The Committee are probably aware that in Ireland the map on this scale of 4 miles to the inch was published

many years back for the Railway Commission, and that map has been found to be of very great use, and there has been a very considerable sale for it, so I assume that it would be valuable in this country also.

4060. (Chairman.) In point of style, setting aside the question of correctness, is that map (showing a sheet of the 4-mile map of England) satisfactory?—It is merely an outline map.

4061. Are the roads sufficiently shown for a small-scale map?—Yes, I think they are.

4062. And are the rivers sufficiently shown?—I think the map, so far as my superficial examination of it goes, is a good map.

4063. You think it desirable that the Ordnance Survey Department should publish it?—I do.

4064. With regard to the boundaries of parishes in Ireland, what course did you take to get them correctly laid down?—Before the Survey was commenced in Ireland a Boundary Commissioner was appointed to settle the boundaries of the different divisions, and having settled the boundaries, to supply to the Ordnance Survey Department sketch maps showing what the boundaries were. The sketch maps were deposited in the localities so that the Commissioner might hear any objections that there were to these boundaries. After the boundaries were so settled and engraved upon the Ordnance maps they became the legal boundaries of the country. In England nothing has been done to settle the boundaries or to make the Ordnance Survey boundaries the legal boundaries. Now it seems to me of very great importance for all purposes of administration, that the boundaries should be settled and determined, and that when engraved upon the Ordnance map they should become the legal boundaries.

4065. Were the parishes in Ireland as distinctly defined as they are supposed to be in England, and as anciently defined?—They were all distinctly defined. Necessarily, after a lapse of time certain alterations took place in the boundaries; for example, a stream alters its course, or a road is altered, or a fence is altered, and the boundaries follow the new divisions. This was made apparent when we revised the maps of the northern counties, and I brought the matter under the notice of the authorities, and an Act was passed enabling the Lord Lieutenant in Council to alter boundaries where it was necessary in consequence of these alterations having taken place, and I believe the same process goes on in Ireland at the present time. I hope that the boundaries will be settled in this country the same as they were in Ireland.

4066. This power to the Lord Lieutenant gave him authority to re-define a boundary?—To re-define a boundary or to alter a boundary.

4067. Had you anything to do with the administration of the Divided Parishes Act in England?—No, nothing whatever.

4068. (Lieut.-Gen. Cooke.) You think it advisable that the civil parish should be taken as the parish for the purposes of the Ordnance Survey, as it is taken as the unit of all administrative bodies and divisions?—I think it is clearly desirable that the parish and other boundaries should be definitely and legally settled. At present it is often difficult in describing lands for parliamentary and other purposes to know in what parishes to place them, whether the ecclesiastical or civil.

4069. Do you think that that one boundary should be the civil boundary—the poor law boundary?—I should say certainly it should be that boundary which is used for all the fiscal purposes of the country.

4070. (Chairman.) Have you anything else to add?—Only to reiterate the great importance of pressing on the revision of the maps so as to bring them up to their proper normal state as rapidly as practicable. I am satisfied that this would be in every way the best and most economical course to pursue.

The witness withdrew.

Mr. GEORGE JAMES COTTON BROOM, A.M.I.C.E., F.G.S., called and examined,

4071. (Chairman.) You are borough surveyor of St. Helens?—Yes.

4072. St. Helens is a town of what population?—75,000.

4073. You have a 10-foot town map?—A 10-foot town map.

4074. When was that surveyed?—In 1882.

4075. So that is a tolerably new map?—A tolerably new map. It was surveyed by the Ordnance Survey Department at the request of the Corporation, and paid for by the Corporation.

4076. Entirely?—Entirely.

4077. What did you pay?—There were 2,785 acres of the borough surveyed, and it cost us 2,750*l*. Of course that is not the entire area of the borough. The entire area of the borough is 6,558 acres.

4078. (*Mr. Koby.*) It is one-third, in fact?—Yes; of course we have a large country district.

4079. Is that the old area of the borough, or have you enlarged?—We have not enlarged. We are going for powers to enlarge now.

4080. (*Chairman.*) Is the building overstepping the part surveyed?—Yes; in some cases considerably.

4081. Have you taken any steps to have that part surveyed?—Yes, we have filled in the map from time to time.

4082. Yourselves?—Ourselves. I produce a new map of St. Helens, and you will see that the red portions are the buildings which have been filled in.

4083. Have your buildings overstepped the surveyed part?—Not inside the borough.

4084. You produce your town map, showing the mode in which you have kept it up?—That is so.

4085. Is it kept up to date?—It is kept up to within the last two years. At that time we understood that the Ordnance Survey map was going to be made, and we delayed keeping it up further because we did not consider it was necessary.

4086. (*Chairman.*) I notice that you have put some excellent work on this, in the way of addition to buildings closely resembling in style that of the Ordnance Survey?—Yes, as nearly as we could. They are put in in red, the Ordnance Survey being in black, so that it can be seen at once what new property has been built since that date.

4087. Are you under the impression that this is as correct as the part which has been surveyed by the Ordnance Department?—Yes, I am quite. I might mention perhaps a little error I found out in the Ordnance map. We had this map prepared some time ago. You will see there is a considerable difference between the one map and the other.

4088. There is no error in the Ordnance map is there?—The error is in the correction in the new map, or revision, not in the old Ordnance. The new work is wrong; the surveyor has taken a wrong line. What I wanted to impress upon you is, that looking at that map, as I do, I naturally, as surveyor knowing the town very well, said something is wrong there; either the survey is wrong, or we have been very neglectful in allowing a man to lay out a passage of this width, I naturally put it over our own survey, and I found this was an error really in your new map which is in process of publication. I produce a tracing from the new Ordnance map now in course of construction.

4089. (*Mr. Mather.*) It rather points to the fact, that if borough surveyors were in constant communication with the Ordnance Survey Department in forming all these large-scale town maps, you would arrive at accuracy perhaps more readily than you do now?—Possibly so, and I say that if an Ordnance surveyor came round and checked my work it would be just as good as their department doing it, and it is quite possible they might find out inaccuracies which we have made, by going over it.

4090. (*Chairman.*) Do you know whether it is the common practice of borough surveyors to keep up their town maps in the way you are doing?—In large towns I believe it is.

4091. Would there be any difficulty in your supplying each year to the Ordnance Survey a sketch of the alterations that have taken place in the town, in the form of a tracing from your town map?—No, but possibly it would be better to have it every two years, because in keeping up that map I only put my assistants on to it when work is slack, or at times when it is convenient to do so, that is to say, perhaps I let the plan go for 12 months, and after that I will say, "There are a lot of houses to put on; we had better have them done."

4092. Would you suggest that that practice should be carried out every year, or every two years, or every five years?—I think it is desirable it should be carried out possibly every two years. I do not think every year.

4093. Would it be possible or desirable to oblige that to be done by legislative enactment?—I think so.

4094. If it is done by legislative enactment you must specify the period?—I should say every three years.

4095. You would suggest that every municipal or town authority in possession of a town map should at least every third year supply to the Ordnance Survey Department a tracing or tracings showing the alterations which have taken place in the town map?—Yes.

4096. And would you then suggest that the Ordnance Survey should give you a fresh edition at once?—As soon as possible after they have made their alterations on the maps, which would take them some little time, no doubt, but I presume they would do it on the old sheets.

4097. You suggest it would not be necessary for them to give a new edition at once, but that they should supply to any purchasers a drawn correction?—Yes.

4098. (*Lieut.-Gen. Cooke.*) You are implying now that the town map shall be on the 1/500 Ordnance Survey scale?—I am referring to that scale only.

4099. (*Chairman.*) Have you considered what should be done when your buildings overpass the boundary of your surveyed sheets?—I should advise then that the Corporation should take the same steps as they took previously in asking the Ordnance Survey Department to enlarge their present survey, and then we should continue it and keep it up on those lines.

4100. Supposing you had the ground adjacent laid out with the minor triangulations completed, for the purpose of this plan, you could then fill up as the buildings spread?—We could very easily do so.

4101. You would not want a perfect plan of the ground as it stood on the 10-foot scale?—No, we should not if we had certain points to work to.

4102. Would you, in filling up the additional surveys so completed, prefer to do it yourself or to pay the Ordnance surveyors for doing it for you?—To pay the Ordnance surveyors.

4103. (*Mr. Mather.*) Would you prefer that to examination by Ordnance Survey officers after your survey had been made?—Either might do. The examination would render the thing quite as efficient as if they did it themselves.

4104. (*Mr. Mather.*) The cost to the local authority might be much less if the surveying staff at your office undertook it instead of the Ordnance Survey sending out special surveyors?—Yes, we should certainly do it cheaper.

4105. From your experience of local authorities, do you consider it would be a proper thing to suggest to them that they should form a department of the engineer's office for the purpose of keeping up this survey in an accurate manner from year to year?—I do not think it would require a department. I think a few men put on occasionally, say, for a week or a month, as the case might be, would be sufficient.

4106. Would it be considered by the local authorities a large increase to the work of their respective staffs if it were made imperative on them by Parliament to keep up this information from year to year?—I do not think there would be any increase of work.

4107. You think no local authority would object to it?—I do not think so.

4108. And from your experience of borough engineers and borough surveyors do you think they would be willing to add such duties to their present work?—They do this at present in large towns.

4109. Therefore, if they had systematic and proper supervision from the Ordnance Survey Department they would perhaps be better pleased with their work than they are at present; they would like to have it checked?—Yes, I think so.

4110. (*Chairman.*) Then with regard to the details of this town map, you have found the Ordnance survey very correct?—I have.

4111. Are there any details here which you would wish omitted, which you think are unnecessary?—There are none.

4112. Are the lamp-posts shown in this map?—Yes.

4113. Is it desirable they should be put in?—I think so. Whatever is shown on the road is very useful to the corporation, and I do not consider that it detracts from the value of the map for private use in any way whatever; of course there are certain lamp-posts moved from time to time but they are very few in comparison.

Mr. G. J. C.
Broom,
A.M.I.C.E.,
F.G.S.

14 June 1892.

4114. Is it desirable to insert trees in gardens?—I do not think they are desirable.

4115. Trees in gardens in towns would be better omitted?—I think so, so that alterations or enlargements of houses could be put on more readily.

4116. Have you any considerable acquaintance among borough surveyors?—Yes.

4117. Do you think their views are in accordance with yours on these matters?—I think so.

4118. And you have reason to believe that they are gentlemen of sufficient attainments to keep the map up in the same way in which you keep your map up?—Yes, I think it is the general practice.

4119. Your map is a hatched map. Is that map published also as a skeleton?—Not on the large scale, we have the 1/2500 published as a skeleton.

4120. That map is also sometimes published for other towns as a skeleton or coloured. That makes a great difference in the cost of the sheet. If it is hatched it can only be published in one edition. Is there any objection to its only being published in one edition, viz., hatched?—None at all.

4121. Look at the specimens on the walls of hatched and coloured maps. The coloured specimen is also published as a skeleton and uncoloured and then it is a very cheap map; coloured as it is, it is a dear map?—There is no reason for its being published as a skeleton uncoloured I think. The other one (the hatched map) is quite sufficient for town purposes.

4122. (Mr. Roby.) You would not like the map simply in skeleton uncoloured?—I do not know. It might be useful in some cases to colour some parts and leave the others uncoloured.

4123. This hatching does not prevent your colouring it, I suppose?—No. We could colour over that, but it would not look so well or so distinct.

4124. (Chairman.) The advantage to be gained is this: if you buy maps coloured they are expensive. By producing them (hatched) in that way only one edition can be produced. You have not the advantage of having a skeleton map to work upon; but you have only one price and that is a low price?—But could not those be produced also without the hatching.

4125. Practically no, but of course it is possible?—Then I think that (the hatched map) is quite sufficient for the town purposes.

4126. (Lieut.-Gen. Cooke.) You find some disadvantage in making corrections from having the houses filled in, and you think it would be a little advantage to have the maps unhatched?—Yes, I do.

4127. (Chairman.) There is a map (the town plan on the 1/2500 scale) the price of which is probably prohibitive. That map is 3s. as a skeleton, but then you would hardly know which was a house, which was a street, or which was a yard?—No.

4128. Coloured as this one is, it is 20s. 6d. ?—That is very dear. I know some of our maps are 12s. 6d.; we have some on a smaller scale, coloured.

4129. If that were hatched probably it could be produced for 3s. 6d. also?—And would be quite sufficient.

4130. And there would be no inconvenience from its being hatched?—No.

4131. (Mr. Roby.) Is it important for your purposes that the maps should be on paper which would be suitable for drawing on?—It is.

4132. A thin paper edition would not be convenient?—We could not fill in; it must be good drawing paper.

4133. (Mr. Mather.) Do you think a revised edition of the 10-feet town map every 15 years would be practically useless to you?—I think in our case a revision would be required at least every 10 years if we increase

at the same rate as we have. You see how these maps are filled up, and they are not all here.

4134. St. Helens is not one of the most active of Lancashire towns?—We are going ahead with regard to building very rapidly.

4135. Perhaps it is a typical town with regard to Lancashire. It represents about the normal increase of your towns?—Yes.

4136. You think a revision once every 10 years would suffice?—I think so.

4137. (Mr. Primrose.) Is the 10-feet scale the smallest scale that would be useful for your town purposes?—Yes.

4138. The 5-feet scale would not be sufficient?—No. The only remarks I wish to make with regard to the survey generally is as to the bench-marks. You now give us only one decimal. It would be very beneficial to surveyors if we had two decimals.

4139. (Chairman.) On town plans?—On town plans, or otherwise a book published with two decimals would be better for bench-marks. We want it for the bench-marks only.

4140. I suppose one decimal is enough on the smaller scales?—Yes.

4141. The bench-marks are given to two places of decimals I am informed?—I do not think so. I have only one here on this map.

4142. (The Secretary.) Probably this has been altered since your map was published?—If you are doing that now that is sufficient.

4143. (Chairman.) Have you any experience of the 25-inch and 6-inch maps?—We have the 25-inch map which is very useful to us. It is rather large for our borough because it is a large borough, and I have from that map made a smaller map half the size. It is about 12·672 inches to the mile. It is just a rough map of the town showing the wards.

4144. Is that a lithographed map?—It is.

4145. Is this reduced by photography?—Reduced by photography.

4146. (Lieut.-Gen. Cooke.) I observe in this you put in a lot of trees in gardens?—Well, it was photographed and they were left in.

4147. That brings to the question then of trees on the 25-inch and the 6-inch maps. Do you consider it advisable to put in all those trees in gardens and so on?—I do not.

4148. You would rather have the maps without?—I would rather have the maps without.

4149. (Chairman.) How often do you publish this?—It has only just been published for the purposes of the wards, and I do not expect we shall keep that up to date.

4150. You corrected the 25-inch map before you did this?—No, what we have done on the 25-inch we put in from the 6-inch, because it was only country districts, and trees, and fences. As far as it went we used the 25-inch of some of the outskirts; where it was not very necessary to be accurate for this purpose because it would not be scaled from, we enlarged from the 6-inch.

4151. (Chairman.) What is the date of the 25-inch?—I think it is the same as this, 1862.

4152. And that is done out of the borough funds?—Yes, it is done at our expense.

4153. It is not any local publisher's speculation?—No, we did that ourselves and we sell them.

4154. Do you get a sale?—Not a very ready sale. If anybody wants this map he can get it. We had 500 of them done, that is all, and we sell them at 12s. 6d. each mounted.

The witness withdrew.

Mr. HERBERT HENRY FULLER, Surveyor, Serjeants Inn, London, called and examined.

4155. (Chairman.) You are a civil engineer?—A land agent and surveyor.

4156. And you have sent your name to our secretary asking to give evidence?—I did; I volunteered.

4157. Have you any notes from which I can examine you?—My notes are very small notes; they are not amplified sufficiently for you to examine me from.

4158. Then perhaps you will proceed from your own notes?—I would say, in the first instance, I do not know at all who has been giving evidence here; I do not know what witnesses you have had, but if on any point you consider you have had sufficient evidence you will of course let me know. The first point I wish to touch upon is paper.

4159. What scale?—This applies very much to all the maps, especially to the 6-inch and the 1-inch. There is a want of uniformity in the paper (*producing 6-inch map of Essex*). I happen to have ordered some sheets in the last week for the purpose of business, and I have brought them with me to show what a difference there is. It was coloured for another purpose.

4160. This is the 6-inch map?—There is a difference in the texture of the paper you will notice.

4161. This is one of the old yellow sheets, and this is one of the white ones?—Yes; I have another sheet which will show it worse.

4162. (*Mr. Roby.*) Did you have any difficulty in mounting them owing to the shrinkage of the paper so as to make them match?—I do not mount them myself. I notice there is a shrinkage though in some places. There again (*Herefordshire*) there is a great difference in the paper. On my complaining as to this I was told it was impossible to get these sheets on the modern paper as they call it. I may say that Philips' being close to my office I always go to Philips'; it is too far to go to Stanford's as a rule.

4163. (*Chairman.*) That is not one of the contoured sheets; few of the yellow sheets are contoured; these white ones generally are?—You see here again we come to a white sheet.

4164. We have heard a good deal of complaint about the paper. Our attention has been drawn to it before? Then, sir, as regards the thickness of the paper. This has been mounted for a special purpose to produce before an umpire. I have had occasion to let and sell a great deal of property, and it would save an enormous amount of trouble in this work could we always use the Ordnance sheets for actually attaching to the leases or conveyances as the case may be.

4165. Without mounting?—Without mounting if they were strong enough. The thickness is against it very much.

4166. It is too thick?—It is too thick. That substance of paper (*Evans's thin tough paper*) would meet the objection entirely.

4167. A thinner paper?—It would be mounted on a mount, and serve its purpose for years.

4168. (*Mr. Roby.*) You would not like one as thin as that (*Japanese*) paper?—No; that would be useless; it would not last the time. I have once or twice had occasion to get some of the French maps, and the paper they are printed on appeared to me to be suitable in point of strength. That is a vellum paper, and it is very substantial. You can see that one (*carte vicinale*) has been handled a good deal, but it has not been torn; you can see by the creases it has been very much used.

4169. (*Mr. Mather.*) I presume it has been damped and smoothed out again?—No, simply rolled.

4170. (*Chairman.*) Would a thin paper like that answer all purposes?—For the purpose I speak of it would answer.

4171. But would it answer all purposes?—All purposes that I have in my mind. Of course there may be a great many purposes outside my particular line of business where thicker papers are wanted, but as far as concerns working on the paper I consider that is quite as good.

4172. Could you work on that paper?—On a large scale. Of course for a small scale it would not be necessary to do so. It would not be quite so clear for the eyes as white paper, but it would stand the work. I believe, as well.

4173. Should you suggest there should be two editions of the maps produced on two sorts of paper, thick drawing paper and thin paper?—No; I do not think it is necessary.

4174. (*Mr. Roby.*) Would this (*Evans's paper*) answer all your purposes?—Yes.

4175. (*Mr. Mather.*) It would answer for the purpose of bringing before a Committee of the House of Commons?—For the purpose of the House of Commons I invariably have plans mounted.

4176. (*Chairman.*) On thick paper?—Yes; this is mounted on thick paper, and we are going to use it next week. As a rule they are mounted in sections, not for roller purposes.

4177. Not in sheets are they?—The sheet is cut up into sections so that it folds up. I mention that because

I have a case at the present time in hand where we want 29 copies of the plan altogether for working purposes. This is for a lease of some property quite close outside London here; and we should have been only too happy to use the Ordnance sheets if in addition to being on thin paper they had been corrected to date—revision is of course another point—but it was found impossible to do so, and making the alterations from notes took more time than the actual tracing.

4178. The map was too obsolete?—Too obsolete.

4179. (*Mr. Roby.*) The price forms no difficulty?—The price forms a difficulty. I do not know that it forms a difficulty to professional people, but it forms a difficulty with our clients; they have a great idea that Ordnance maps are expensive.

4180. (*Chairman.*) About 1s. each, are they?—2s. and 2s. 6d.

4181. Considering what is on the map, do you consider it expensive?—No doubt for the work that is on the map it is very cheap indeed; only a public department could supply them at the price, I think.

4182. Is not that impression as to the expensiveness of the maps derived from the cost of the coloured sheets?—Very often it is.

4183. Would it answer the purpose, do you think, to abolish the coloured sheets?—For my purpose I use them plain. The coloured sheets are of very little use to me. There is no great advantage in the colouring of the sheets, and if they are used to go with a report the colouring is absolutely unnecessary; I would rather not have it.

4184. Would you like them hatched?—I think so.

4185. Now you have two forms, skeleton and coloured that is to say, the skeleton filled in with colour. Supposing instead of having the skeleton filled in with colour it was filled in permanently with hatching, would that answer all the demands of the public?—I think in large scales it would.

4186. The 10-foot and 25-inch?—Yes.

4187. (*Mr. Roby.*) That hatching would not form any difficulty in the way of your colouring such parts as you would wish to colour?—Not in the least, because it can either be body-coloured or with a line of strong colour round if you wished to catch the eye quickly.

4188. (*Lieut.-Gen. Cooke.*) The colour kills the hatching completely?—Yes; if you want the same plan for another purpose you can get another sheet.

4189. (*Mr. Mather.*) In fact the colouring ought to be left to the purchaser to colour as he thinks proper?—That is so.

4190. You were speaking of the price of these maps just now. Have you compared them with the French maps of a similar character?—On the small scales.

4191. Do you think the French maps are cheaper?—Yes.

4192. (*Chairman.*) You probably think the price of that (coloured town plan) would be prohibitive?—Yes; and so far as I am concerned it would be prohibitive.

4193. That map (hatched) produced at 3s. would answer every purpose?—Every purpose. I think attention should be drawn to that case where we wanted 29 copies. You will see that we only got one copy, whereas we should have got 29 or 30 copies, or perhaps more, if the maps had been such as we required.

4194. (*Mr. Roby.*) The objection in that case being to the map not being brought up to date, and being on thick paper?—Yes.

4195. (*Chairman.*) Are you aware that the Department at Southampton will print 6-inch and 1-inch maps on thin paper if special application is made?—No, I cannot say I am.

4196. Would it be possible to explain that to the public or get it generally known?—Want of publicity is one of the great difficulties, I think, that you have to contend against, want of publicity as to what you do and what your methods are at Southampton. I think in the case of local authorities and large bodies the information does gradually creep in, but with the general public, no.

4197. How would you suggest that the general public should be made more acquainted with it?—That is a point I have considered and put under another head. I come next to the price as being the next important thing, and I rather look at the question from

Mr. H. H.
Fuller.

14 June 1892.

- Mr. H. H. Fuller.*
14 June 1892.
- my own point of view. Considering that the country is spending a quarter of a million a year, or very nearly a quarter of a million a year, the total amount you get back from your sales is really not great. Whereas you are getting now something like 13,000*l.* or 14,000*l.* a year from sales, I venture to think that if you reduced your price by half, in a year or two your returns would reach the same figure.
4198. (*Mr. Mather.*) And probably more?—And probably more.
4199. (*Chairman.*) Have you had any difficulty in getting uncoloured maps?—No; but I have experienced a great difficulty in ascertaining what maps are published. The indexes, even in the annual reports, require a good deal of study before one really is able to grasp what is published and what is not, especially with reference to contours and such details. I notice from the last report there has been a slight decrease in the sales, and it occurred to me to inquire what was the reason, and from my general knowledge, and from so often having to refuse sheets because they are not up to date or have not the information I want upon them, especially with reference to dealing with property, I have come to the conclusion that the falling off is largely due to want of revision.
- The next point I would touch upon is the indices—the index to each of the scales. Very often, being busy, I have not time, when I want a plan immediately, to go down to Stanford's, and I go to Philips's, which is quite close to me, and I find great trouble there, in consequence of their only having a very small stock, in seeing the indices of the various parishes; and in making inquiries, not only there, but at Stanford's, I noticed that in the case of Essex, of which county we happened to want a large quantity of parish sheets in one case a year ago, there are 400 parishes, or very nearly 400, and those at 2*d.*, as Philips's people pointed out to me, would come to 3*l.* 6*s.* 8*d.*
4200. You mean the indices?—Yes; whereas, as I have often suggested to them, if they themselves would buy 1-inch sheets, and mark on them in red the 6-inch and the 25-inch lines, they would have a very much better index; because on the small index which you publish at 2*d.* you cannot point out any particular field or house or anything of that kind; you can only point out generally what is on it, and it is very often incumbent on one to go oneself in that case, whereas by having a general index of the county in one's office you could tell a clerk to go and get a sheet. (*A county index was handed to witness.*)
4201. (*Mr. Mather.*) That is really a map. Although it is an index it is to all intents and purposes a map?—A parish map, yes. I had one of these I was working at the other day. Of course they are very good as far as they go, but of course they show no details of the parishes.
4202. (*Mr. Raby.*) Do not they show detail enough to enable you to identify what particular part you require?—They may in the case of large properties where you are dealing with 1,000 acres or anything of that kind. If you have been on the spot, the general knowledge of the lay of the land enables you to indicate pretty well where you want sheets, but in dealing with small properties they do not by any means help you.
4203. (*Chairman.*) These are the 6-inch sheets. Cannot you pick out any 6-inch sheets you may want from that map?—You may pick out a 6-inch sheet.
4204. But not the 25-inch. The 25-inch is on a different index. Every one of those divisions contains four of the 25-inch sheets, and therefore any person in possession of those dividing it again into four has the 25-inch sheets?—Yes.
4205. (*Lieut. Gen. Cooke.*) Here is the parish index?—You see these, except as indexes, are no good whatever, and one has to pay for them, and if the outline 1-inch map were published, giving the divisions of the 6-inch and the 25-inch maps, it would form a very good road map, and could be published at a cheap price. I should think as cheap as this.
4206. (*Chairman.*) Supposing that was kept as the sole index, and the 25-inch sheets were shown by blue lines?—I think that would be a great deal of assistance. I am not certain that the smaller villages would be so efficiently shown upon this as I see they are here.
4207. Would not you want as much detail as there is there in order to find out your sheets?—Speaking from the public point of view, I think the public might, but those people who are acquainted with the plans I think would not.
4208. You would be inclined to have one combined index of the three separate scales?—Yes.
4209. One combined for those who understand the thing?—I do not quite follow your question there. Of course we must look to a certain degree to the cost of production and so on, and you cannot have so many indices, but my own opinion goes to what I have suggested.
4210. (*Lieut.-Gen. Cooke.*) That is a combined index?—No, take the 1-inch map and rule it, but then as a rule I think it is found that the public do not buy the 25-inch map very much. The public want maps more for tourist purposes.
4211. That is the 1-inch map?—Yes.
4212. (*Chairman.*) This is an index to the 1/2500; it is itself a 1-inch map?—Yes.
4213. (*Lieut.-Gen. Cooke.*) That is exactly what you want?—Yes.
4214. What would you do to that?—I suggest it being taken on the 1-inch. Instead of having these extra indices, rule them out in the 1-inch map itself.
4215. That is a matter of arrangement—I mean you can take any scale you like and put the index to it on the 1-inch map?—These indices will be useless except for the purpose of indices, and they are expensive to get in the case of each county.
4216. (*Chairman.*) Supposing they were supplied gratuitously?—That would meet the case, but I understand it is a very "large order" to supply indices throughout England.
4217. (*Lieut.-Gen. Cooke.*) You would publish an edition of the 1-inch map with the sheets ruled on it. That is, in fact, what you want?—Yes. I have not seen this new one. The difficulty I am speaking about is in the parish index.
4218. Does this modify your opinion?—Yes, it modifies it certainly.
4219. If you have county and parish indexes these two together would give you all you want?—That would meet the objection very well indeed.
4220. (*Mr. Raby.*) I understand you to say you thought a 1-inch map ruled for the 6-inch and for the 25-inch sheets would be convenient to tell you which sheet you wanted and would also be a useful map in itself?—I think so, yes.
4221. (*Chairman.*) The scale of that map (Leicester-shire) itself is 2 miles to the inch and it is an index to the 6-inch map?—Yes.
4222. If you divide up all these squares into four you will have the index to the 25-inch map?—Yes.
- The next point I come to is the want of uniformity in the impressions. This map here (Essex) will show you very well indeed. You see how different are the impressions on the two sheets. If you look down this corner of the sheet (the south-east corner) that is much better than the north-west corner.
4223. (*Lieut.-Gen. Cooke.*) This seems to be a defect owing to the original plate wearing out.
4224. (*Mr. Mather.*) That could not occur again in all time. (*The Secretary.*) The sheets round London have been in such demand that in order to save the copper plates the maps have been printed by transfer to zinc?—I quite understand that. This happens to be in a locality where the population is very largely increasing, in fact it has had the largest increase during the last decade of any place; at the same time the railway to Walthamstow, which has been opened I think 18 years, is not shown.
4225. You mean on the improved impression?—On the improved impression. Then as to incorrectness and incompleteness of detail, that really relates to revisions. I have been asked my opinion as to whether the assistance of the local authorities and the co-operation of local authorities would quicken revision, and I must say I have always thought so, I have always contended that if it were possible, by means of legislation, to compel the surveyors of the county and borough surveyors and engineers to be sent to Southampton for the purpose, if not of being actually used themselves, of forming the basis of information it would be of the greatest assistance. Very often I go into a town to look at some property and find that, being in the suburbs, it is not shown on the sheet where I should

have expected to find it; my quickest way is to go to the borough surveyor or the county surveyor, and from him I get the information.

4226. (*Chairman.*) Consequently you are acquainted with the condition of the borough surveyor's maps?—Generally acquainted, yes. I often inspect them for the purpose of seeing whether the property I want is on them.

4227. Do you find that the map on the 10-feet scale is kept up by the borough surveyors?—Yes.

4228. And are they fairly accurate?—I think in most cases I have come across they are very accurate certainly. I have never had occasion to find fault with them.

4229. In fact you think a very elementary examination by the Ordnance surveyors would suffice for adopting those plans for the revision map?—Yes, for the revision purposes I certainly think that all actual surveys, in the first instance, ought to come through the Ordnance Department.

4230. I assume there is a town map made by the Ordnance Survey, and that you find on that town map the practice of surveyors is to keep on making corrections. Then I ask you whether you have found their corrections to be approximately correct?—Approximately, yes.

4231. And you think that a very elementary examination by the Ordnance surveyors would establish the fact of their correctness sufficiently to justify their being put on to the official map?—I think so.

4232. And that would be a great saving of expense?—A great saving of expense.

4233. (*Mr. Mather.*) And of time?—And of time; because the Ordnance Survey Department, I assume, has no official intimation of alterations.

4234. (*Chairman.*) None at all?—There again, I think, a great deal can be done by combination. Generally speaking in boroughs it is necessary to deposit plans before any alterations are made, and these plans are always accessible for inspection, not perhaps by anybody, but if one knows the right way to go to work they can be seen. There is no compulsion to show these plans to the public, but they are always on view to anyone who wants to go and see them—that is professional people; so I think that the combination of work in that way might be effective. I think these plans should be always to one scale, and should be open for examination by the Ordnance Department, or if necessary the borough authorities should be compelled to send maps to the Ordnance Department; it would help enormously.

4235. You heard the examination of the last witness on this point?—Yes.

4236. You agree with what he says?—I quite agree. Another point, I think, is that in the case of public undertakings—new railways and such things as that—where it means going through a great many parishes, the promoters ought to be compelled when they alter the face of the country to deposit actual surveys after the line is made, not merely the surveys which accompany the Bills in Parliament, which are no good really because they need not stick to their plans as deposited, but when the line is complete. I have in my mind the Birmingham Corporation who are buying, as I daresay you know, 70 square miles for their water supply scheme. In 10 years time the whole of that country will be altered. It would be a very small extra expence to them, I daresay within four figures, to make a complete actual survey for the purposes of the Ordnance Department.

4237. (*Mr. Mather.*) Do you think it would be better, in order to accomplish that, to have a resident Ordnance officer in various centres throughout the country, who could come into close relation with the local authorities, and obtain from them direct all this information, and then communicate it to the Department?—I think a certain amount of decentralisation from Southampton would be a good thing in that way, but I think it would be a great mistake to carry it too far.

4238. I mean one official residing in certain centres. Take a large district in a county for instance, the duty of looking after what was being changed or altered would fall, not upon the municipalities but upon the county councils. It is suggested that the Ordnance Survey officer should come into close relations with them, and they would be obliged by Act of Parliament to communicate to him all the information he required, and that would keep them in constant touch with the

Ordnance Survey Department?—I think there should be compulsion in the first instance on all these authorities to give notice to the Ordnance Survey Department.

4239. (*Chairman.*) Are you aware that these centres already exist?—The decentralisation of the survey?

4240. Yes?—I understand there are one or two instances. I am not aware that there is any regulation or regular centres where one can go for the purpose of obtaining information from Ordnance Departments.

4241. (*Chairman.*) There are eight stations throughout England?—Of course one is quite aware that the survey is going on in certain districts.

(*The Secretary.*) The centres are Edinburgh, Carlisle, York, Derby, Chester, Redhill, Clifton, and Bedford.

4242. (*Chairman.*) You think that if a district were assigned to each of those stations the officer in charge being in communication with the local authority all this might easily be done?—I think the parts of the machine are all there, they only want putting together really.

4243. (*Mr. Mather.*) At what period would you issue the revised editions?—On that point I think it very largely depends on the increase of population or the increase of manufactories, which of course brings population, but I come very much closer than the last witness whom I heard say ten years—I should say five years—from three to five certainly. With regard to this district of Leyton the map which I have before me here cannot pretend to show anything like the actual state of things owing to the increase of houses and so on. The population during the last decade has increased 133 per cent.

4244. (*Chairman.*) You would be inclined to say that the revision should take place as often as is necessary, according to the growth of population, and not less than once in 15 years?—Certainly not less than once in 15 years.

4245. (*Mr. Roby.*) I see this map is from 18 to 28 years old?—It is the latest we can get.

4246. It hardly proves the necessity for a five years' over a ten years' revision?—I should say that in agricultural districts ten years, except in special cases where new industries spring up, or railways or other large works are carried out, would be a good limit of time.

4247. (*Mr. Mather.*) You mean 10 rather than 15?—Yes.

4248. (*Mr. Roby.*) And in towns and rapidly growing places, five years?—Yes. I am speaking now of publication rather than actual survey.

4249. The new edition?—Yes. I also notice in one of the last Reports (in 1889 I think it was) of the Ordnance Department they mention that the levels wanted revising very much, especially I think in the salt districts, or in one of the mining districts. Of course that carries with it its own proof. You see at once where the subsidence is going on. The next point I come to is the insufficiency of contour lines. I might mention as to the cost of revision, that it is becoming greater and greater in proportion to the delay; of course it necessarily follows.

As to the contour lines, I had occasion in that map of Herefordshire which I showed you just now to require the contour lines, but I found that I could get only a portion of the district as the other portion was not published. I understand that the map is being improved every day, and that they are publishing contour lines.

4250. (*Mr. Mather.*) It is all published now?—That shows the insufficiency of data to go upon. I could not get this at the time I wanted it.

4251. (*Chairman.*) That is a question of agency, I think?—Very often I have been put off with some old sheets which they wanted to get rid of.

4252. (*Mr. Mather.*) Would you recommend a withdrawal of the old sheets when a new edition is published?—I think so, yes.

4253. You are speaking now of contour lines. You are aware that the new edition of the 6-inch map is contoured?—Yes.

4254. And the old edition is uncountoured?—Yes.

4255. Would you withdraw from sale altogether the uncountoured map?—I should say yes, but I am speak-

Mr. H. H. Fuller.

14 June 1892

Mr. H. H.
Fuller.

14 June 1892.

ing without knowledge of what amount you have invested in the old sheets.

4256. It is proposed to sell the old uncountoured map at 8d., and to leave it before the public in that way, to be sold as the public may require it. Do you think that is injurious to the interests of the public and the Department that this map should be sold at a reduced price?—No, I do not think so. I think it is a case where one would expect to pay a certain price for a map up to date, and for a map not up to date one would expect to get a reduction.

4257. You would have it announced by the publishers that they were disposing of uncountoured maps at 8d. and countoured maps at 1s. 2—Merely for the purpose of getting rid of the old ones, and not throwing away money entirely. I think you might find some of the public—landowners and so on—would take these old maps, but I think professional people, you would find, would not.

4258. Then you would not recommend the Department to withdraw that map altogether?—I think many people might like the uncountoured map. A great many people do not understand the contours, and look upon them merely as an addition which “fogs” them.

4259. It is a nuisance to them, in fact?—A nuisance. But then on the question of contours, the contours as far as they go are very nice and very complete, but I do not think they go far enough.

4260. Is that part of your notes?—Yes. Then the next point I come to is absence from the maps of explanation and information.

4261. That is to say, that the meaning of the marks on the maps is not indicated on any part of the map?—Yes.

4262. It has been suggested that the leading marks should be placed round the margins?—Similarly to the French maps. That is very good in the French maps, but I think they go too far. I think they give more information perhaps than is absolutely necessary in our case, but that is the line I take.

4263. Instead of the information being concealed in a sheet of characteristics or area book, should it be on the map itself?—I think so. I think considering the price you pay for the map it should contain everything. From that I go to the question of areas on the 25-inch map which I have been asked to give my opinion upon, and I think it is of great importance.

4264. The question of the areas being stamped?—Yes.

4265. Do you think you want the area book too?—No, I do not think so at all; and the decimal is not a great hardship, anybody can work it out if he wants to. It has been mentioned to me before that the decimal was a difficulty. Then I come to the printing in colours, and I must say that I think it of great importance. I have brought a French map.

4266. I think we know the French *carte vicinale* (maps of the Isle of Wight in various styles were handed to the witness). These maps now in your hands are experiments. They are all from the same drawing. I will ask you which you prefer, one is a black engraved map, one is an engraved map with hills printed in brown and one is a photo-zincographed map in colours?—There is no doubt that the coloured map is the best.

4267. You think that will be the most popular?—I think so. The colours catch the eye immediately.

4268. (Mr. Roby.) You mean the one that contains two or three colours—The houses and buildings in red, the woods in green, the water in blue, the hills shaded in black. In the case of one of the Portsmouth and the Isle of Wight maps, the hill-shading is in

brown?—I think the railways might be shown by a hard line there instead of an open line with improvement.

4269. (Mr. Mather.) A hard deep black line?—Yes.

4270. (Chairman.) You would say that coloured map is a satisfactory map?—Oh, yes, satisfactory as far as it goes. I suggest that improvement as to the railways, but it is a great improvement on the maps we are used to.

4271. (Mr. Roby.) Would you give much more money for it?—My point as to the price I have already touched upon, and I do not think you ought to charge much more for that, but of course I understand it is more expensive to produce.

4272. (Chairman.) Does the brown hill-shading satisfy you?—Yes. I think the brown hill-shading is good, and it is easier to spot it, as it were, than the black hill-shading.

4273. It does not obscure the writing?—It does not obscure the writing so much.

4274. Would you look at that map (Argyllshire) on the wall; at a distance that would appear to be a preferable map, I suppose?—I think so.

4275. But if you came to use it as a map, and wanted to read it, you think it would be better with the hill-shading in brown?—I think it would be better in brown. It would not have the difficulty which this sheet (Wales) presents, that it is difficult to tell which is hill-top and which is valley.

4276. What part of Wales is that?—Breconshire. Here is a case of a valley being very white. I daresay it is an old plan. I see the map is dated 1832.

4277. This is the old 1-inch, our old survey?—I have already touched upon the difficulty of obtaining information and the want of publicity as to the method of distribution. You have probably information on the subject from agents.

4278. That does not belong to our inquiry. Incidentally we have heard a good deal about it?—One trouble is that we cannot get the plans quick enough. As I say, if I want a plan I want it at the moment, and we have to wait if it is down at Southampton. I should suggest that an agency be established in every town of a certain population, where you publish the 10-foot map for instance, and that they should be sold at the Post Office.

4279. It might be desirable to put up notices at the Post Office?—Yes, or in any case the address of the agent in the town.

4280. (Mr. Roby.) You say you want plans in a moment. I suppose if you wrote to Southampton you would get them next day or in two days?—Of course, but we have to wait for them, and it is a great thing to be able to have them at hand.

4281. You cannot have a complete set in every town?—I am not suggesting that you could. I suggest a specimen being kept in each case.

4282. (Chairman.) No large stocks kept?—Unless a sufficient sum were deposited.

4283. In every town there should be means of information as to what maps are to be had of the official agent?—Yes, and with a thoroughly understandable index. That would meet that point entirely. Then there is a very important point in the annual reports with reference to the use of Ordnance maps for purposes of assessment and registering titles.

4284. Is that a subject you are acquainted with?—I am very largely acquainted with assessment.

4285. If that is the case I think we should like to take your evidence at some length upon that?—Then I shall be happy to attend on a future occasion convenient to the Committee.

Adjourned till Wednesday, June 15, 1892, at 11.30 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

TWELFTH DAY.

Wednesday, 15th June 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART, M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
 Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
 Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.
 Mr. HENRY JOHN ROBY, M.P.
 Mr. CHARLES FORTESCUE BRICKDALE.

Major DUNCAN A. JOHNSTON, R.E., *Secretary*.

Mr. JOHN ALLISON, City Surveyor, Manchester, called and examined.

Mr. J. Allison.

15 June 1892.

4286. (*Chairman*.) You are a civil engineer, and borough surveyor of Manchester?—Yes. I thought you would allow me first to read the statement that I have prepared which is as follows:—Within the past two years the new Ordnance Survey 1/500 scale has been published for part of Manchester to the extent of 6,618 acres, leaving out an area of 6,600 acres of the city which has not been surveyed since 1845.

4287. Does that date, 1845, refer to the 1-inch map or to the large map?—To the 5-feet-to-a-mile map.

4288. You had a map of 5 feet to the mile in 1845?—Yes, it was surveyed in 1845 and published in 1848.

4289. Did you pay for that yourselves?—No, I think not.

Question 1.—The best method of keeping the town plans of the Ordnance Survey up to date?—In towns where a large population is congregated together as in Manchester, it is, in my opinion, highly desirable that the Government ought always to be in possession of correct plans up to date for their own information and guidance.

This, I believe, to be necessary, irrespective of the requirements of municipalities, and in my opinion the responsibility of keeping the survey of the country up to date should devolve upon the Imperial Government, as, when published, those plans are useful for all public work as well as to municipal authorities, and being published by the Government, they are the only plans that are, as a rule, admitted in evidence in a court of law without having to prove their correctness.

Municipal authorities have from time to time to revise their plans, but being only for their own use, the public and the Government would not be in possession of the corrections up to date.

I am of opinion, therefore, that the Government ought to continue this work and also to have it carried out and executed in a creditable manner.

Question 2.—To what extent can municipal authorities assist in doing so?—As the Government require plans for their own use and dispose of the sheets at a given price, no financial assistance ought to be expected from municipal authorities, as these plans are greatly used by all persons, whether working in harmony with or against the corporation. Corporations are compelled to keep their own surveys up to date between the periods of the corrections carried out by the Government, therefore they are spending a sum annually towards this particular work.

It is, I believe, acknowledged by all corporations that in this and all other work carried out by the Government their duty and pleasure is to render to the Government all the information and assistance they possibly can.

Question 3.—At what periods town and suburban, also agricultural districts should be revised?—This will depend entirely upon the importance of a district. For towns of the size and importance of Liverpool, Birmingham, Glasgow, and Manchester and all county boroughs, I think a revision of the Ordnance plans should be made at least every tenth year.

I am also of opinion that suburban districts adjoining such towns as I have named should be treated in a similar manner, as the change from rural to urban in many instances is exceedingly rapid and whole districts are entirely changed within the period I have named.

As regards agricultural districts if no material change takes place I think a revision of the plans once in every 30 years would be sufficient.

At the present time there is an area of about 6,600 acres which may be considered rural or agricultural within our own city boundary. This is so changed that the 6-inch map surveyed in 1845 is of no practical use whatever.

Question 4.—Whether the Ordnance Survey plans as at present issued satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed and price?

Style and Execution.

In my opinion the Ordnance plans surveyed and published for town purposes from 1845 to 1849 were, so far as regards style of execution, much superior to the Survey plans recently issued for Manchester on the 1/500 scale. In fact I consider the plans recently published would not do credit to any local firm, far less to the Government.

For correct measurements the outlines on the recent plans are much too heavy, and the hatching being also heavy, the details, figures, lettering, &c. are difficult to trace, and the whole production is more to be compared with rough woodcuts appearing from time to time in daily papers than work usually issued from the Government Department or from an engineer or surveyor's private office. I consider the greatest cost is incurred in the actual survey and plotting of the plans and not in the draughtsman's or lithographer's work; it is therefore, in my opinion, unwise to try and save so small an expense in giving tone and finish to the sheets.

I believe that all plans would be of greater value to the public if finished without the heavy hatching, and if the finely hatched or dotted shading were introduced, which gives the plans the effect of a solid body colour for buildings, as previously carried out on the 1/1,056, (5-feet scale) plans. These remarks also apply to all other plans published for town and suburban districts.

Form.

For town work I consider the 1/500 scale plans an advantage over the 1/1,056 plans, as measurements can be more correctly ascertained from them, and corporations, railway companies and others applying for Parliamentary powers can use the 1/500, whereas the 1/1,056 is not sufficiently large to allow of the numbers required to be put upon such plans for reference to be clearly indicated. In adopting this scale there is this disadvantage, that only one fourth of the information is given upon the 1/500 to that on the 1/1,056, or in other words, each sheet on the 1/1056-scale plans represents an area of 156 acres, whereas the 1/500 sheets represent only an area of 38·4 acres.

The disadvantage in this for town work is that when laying out public improvements, drainage schemes, or other important works, the larger-scale plans cover a very small area compared with the 1/1,056 plans.

To overcome this inconvenience I am of opinion that for town and suburban work the 6-inch-to-a-mile survey might be dispensed with, and the 1/2500 or 25·344 inches to the mile plans, substituted. This would form an exceedingly useful plan for town work where large

Mr. J. Allison.

15 June 1892.

areas and districts had to be dealt with, and upon this plan all necessary information could be more clearly set out than upon the 6-inch plan.

I am of opinion that the actual size of the sheets now published are the most convenient and suitable size that could be adopted.

Information conveyed.

The 1/500 survey plans recently issued are exceedingly deficient in many respects as compared with the 1/1,056 plans, issued in 1848.

Upon the 1/1056 plans all arches underneath the several railways, abutments and piers of bridges, tunnels, and covered water-ways are all correctly delineated, and also the interior of all public buildings.

On the new 1/500 plans all these important details are omitted. Take, for instance, the River Medlock from Knott Mill to its outlet in Elm Street, a distance of 600 yards. The river is made to suddenly disappear, and the public see or know nothing more of it, and cannot obtain the information from the published plans, whereas on the old Survey plans, the course of such rivers and other work were all clearly shown by broken or dotted lines on the plan.

The same remarks apply to the River Irk at its confluence with the Irwell; the river course suddenly disappears, and any person unacquainted with the district could not possibly trace its outlet from the maps now published.

In my opinion all these details ought to have been indicated on the new plans.

Price.

The 6-inch and the 1/1056 maps as published, say, at 2s. 6d. per sheet, I consider reasonable in price, but in my opinion the price of the new 1/500 sheets should be reduced.

Question 5.—Whether any of the minor details, such as trees, paths, &c., may be with advantage omitted from the Ordnance Survey plans?—For town and suburban plans it is advisable to show as much detail as possible, but as regards garden shrubs and trees in connexion with dwellings, I think it quite unnecessary to have them shown. They ought, in my opinion, to be shown on the plans in agricultural districts, as in many instances they form a good key to particular districts.

4290. It has been suggested that all municipal authorities and local boards should be put under legal obligation to send a tracing of the plans deposited with them to the Survey Department. Do you keep up your town map carefully?—We do to a certain extent; we revise it, I think, every two or three years. The drawings which are supplied by builders are not immediately put upon the plan, and we do not put in the details as you do in the Ordnance Survey; we merely put the building in block.

4291. You do put it in in block every two or three years?—Yes; but we do not show the buildings in detail. We generally show the divisions of the houses.

4292. You do not show the rear of the buildings as well as the front?—We do not show the rear in detail.

4293. Would there be any difficulty in your showing the rear of the buildings as well as the front?—No difficulty whatever. It is only a question of expense.

4294. Considering that you have to take cognisance of all these matters in some way or another, would it be a very serious expense for the town to keep their papers in such a state that they could send tracings of all the alterations to the Survey once a year?—It would; it would require a special staff constantly, and it would be an exceedingly expensive matter. You see we have the groundwork of the Ordnance Survey already, and it only requires filling in.

4295. (Mr. Roby.) The alterations of the Manchester plans, I suppose, during the year would be very considerable?—Yes, no doubt; since the out-townships have joined us they would be very considerable.

4296. (Mr. Mather.) That would not involve much work for the Department, though the alterations in the towns have been considerable?—That would not involve so much work to the Department in plotting the additions upon our plans, but, supplying tracings of the whole of the drawings submitted to us would involve a great deal of labour and expense.

4297. (Chairman.) Yesterday we had the surveyor of St. Helens here and he showed us his town plans corrected up to date in almost identical work to that

put on by the Ordnance Survey, and he said he thought it was a general practice in these large towns?—I think it is, so far as I have seen. In the smaller towns I believe they do it, but in larger towns I do not think they could carry it out.

4298. You say in the evidence that you have given that the Government ought always to be in the possession of correct plans up to date for their information and guidance; but is it a fact that as far as regards the details of towns the information is more required for the municipality and the individuals residing in those towns than for Government purposes?—There is no doubt of that; but I think it is very important too that the Government should be in possession of correct plans either for military, police, or for political purposes.

4299. Would not all purposes be answered by the 1/2,500, the 25-inch map?—Possibly they might.

4300. This very large scale is almost exclusively required for municipal purposes?—Yes, I believe so.

4301. And it costs a great deal more to produce than the 25-inch?—I do not know that it will; the whole expense is really in the survey. The larger scale, as I point out, is a matter of clerk's work, surveyor's work, lithographer's work, and printing. The whole cost is really in the survey and in the plotting.

4302. It has been stated to us that the 10-foot map costs about twenty times as much to produce as the 25-inch map, including the original survey?—I should not have thought it; of course there is much more detail upon it.

4303. When the Ordnance map is fresh, that is to say, not obsolete, you are quite satisfied of its correctness?—We have nothing to complain of as to its correctness.

4304. You would lay out works from it at once with perfect confidence?—No, we always check the survey in all cases.

4305. (Mr. Mather.) That is the 10-foot scale map?—We have not had the 10-feet more than 18 months. We have not found anything materially wrong as yet except those details left out of it which we think it important should be included.

4306. (Chairman.) You have stated that you think no financial assistance ought to be expected from the municipal authorities, as these plans are directly used by all persons, whether working in harmony with or against the corporations; you are not of opinion, then, that these plans are so entirely for the use of the municipal authorities of the town that it would be fair to impose the entire cost upon the municipality?—I do not think it ought to be. I think that the Government should have the control of the survey and carry it out as a national map.

4307. You think the national requirements are not sufficiently satisfied by the 25-inch?—I do not think they are; they do not give the detail you require as the larger-scale maps do.

4308. Is not that excessive detail a municipal and local question?—To a great extent it is; I admit that.

4309. Supposing this legal obligation that you have suggested were put upon local authorities, do you think there would be any serious objection to it?—That is, keeping up their own survey?

4310. Not keeping up their own survey exactly, but supplying to the Ordnance the tracings of all alterations that have taken place during 12 months or a longer period; then for the Ordnance to examine them and test them so that they should be ultimately responsible for them, put them on the plan and republish at comparatively short intervals?—I do not think there would be any objection to that; but what is running in my mind is that I do not think that would be a satisfactory arrangement. Of course you could have the tracings of the plans, but it would not do to publish those without going on the ground and making a special survey and correcting the work as carried out.

4311. You think you could not supply them with sufficient accuracy to be able to dispense with the actual survey, and you also think that without examination on the ground they would not be sufficient?—They would not. I think it would be much safer if you were imposing any test on the municipalities at all, to compel them, as it were, to keep up their own town survey as correctly as you would your own Ordnance survey, and then get the tracings from

the Survey sheets rather than the building plans. We receive the plans from the builders; and see that they are properly carried out, but of course we are not particular to an inch or two. Say that it is a villa; we are not particular to an inch or two or a foot whether it is this way or that way upon a man's own ground—whether front or back, so long as it does not affect the building line or street line; and if you were taking these plans you would not get the correct position of the building as carried out, and it would be much safer if you were compelling us in the first instance to keep up our plans to date; it would be very much less trouble if you were to get the correct tracings from our corrected sheets.

4312. In fact it should take this form: a legal obligation on you to keep up your plan correctly and to supply a tracing of it to Southampton?—Yes, instead of sending you the building plans.

4313. Do you think there would be any serious objection to that on the part of the local authorities?—I am not in a position really to answer that question.

4314. (*Mr. Roby.*) You could not tell us what you think the expense would be?—I could not say; I do not think it would be a large item.

4315. (*Sir A. Geikie.*) Would it require a great increase in your staff?—I think not. I think 500*l.* a year would cover the expense.

4316. (*Mr. Mather.*) It is gradual work and would go on daily or weekly without much extra expense?—Two men constantly at it would do the whole thing.

4317. (*Chairman.*) That would greatly facilitate the operations of the Ordnance Survey?—There is no doubt of that.

4318. Instead of having to look for the alterations to put upon their map they would then be practically in possession of the map, and it would merely want testing?—Exactly.

4319. (*Mr. Roby.*) Is it your impression that that could be accepted by the Ordnance Survey without testing it on the ground?—I do not think it ought to be; it is published as a national map, and I think the responsibility for its correctness should be placed upon the Government. We of course would give to you all information as closely as we possibly could. We have it for our own use; but I do not think it would do for the Government to publish a map without testing it for themselves. It would entail very little expense.

4320. (*Chairman.*) You say that you think every tenth year for large towns would be a sufficiently frequent publication?—That was in the event of the Ordnance Department revising the survey as they have been doing recently. If you alter it in such a way as you have indicated, of course it would be better to publish at more frequent intervals.

4321. Do you think it would be a satisfactory arrangement that in the event of such a scheme as I have indicated being carried out, the Ordnance Survey Department should be required to furnish manuscript drawing of their altered map every year, and that once in five years they should publish?—I think that would be satisfactory; the changes are not so great in five years. There is a wonderful difference between five years and 40 years, that being the time since the last revision.

4322. I suppose 40 is not satisfactory?—No, it is not satisfactory.

4323. Would such a scheme as we have suggested work better and easier supposing you could communicate with an Ordnance Survey officer that such alterations were in progress and you required his presence so as to put them at once correctly on to your map?—I do not think it would be practicable. He could not be always there putting two or three or four houses on. I think you would have to allow of a certain amount of work being done before you could bring him there to make his corrections, as it would entail enormous expense, and it would be quite unnecessary, I imagine.

4324. You say that only about half of the municipal area of Manchester is surveyed on the 10-foot scale?—That is the case.

4325. Are your buildings extending beyond the boundary of the surveyed area?—Yes, rapidly.

4326. And what course do you take with regard to getting any large-scale survey of that portion?—We have none practically of that portion: for this reason—that it was only in 1890 that we extended the area of the city from 9,000 acres to 14,000 acres, so that it is

the new districts which have been taken into the city, which were practically rural districts, that are not included in the 10-foot scale.

4327. Have you made any application to the Ordnance Department to enlarge that surveyed area?—We did. We made application about six months ago to the Ordnance Department to see what they would do it for, and I think it was 7,000*l.* they wanted.

4328. For how many acres?—About 6,000 acres.

4329. (*Mr. Mather.*) What is the newest map you have found describing that new district?—We have nothing newer than the 6-inch to the mile, which was surveyed in 1845. One or two local board districts have maps of their own, but they are very indifferent and not reliable.

4330. (*Chairman.*) When you want extension would it be sufficient if the Ordnance Survey Department were to supply minor trigonometrical points instead of making a complete survey showing all the details; if they were to re-survey smaller triangles for you and give you a skeleton map, so that you could set out your new lines of buildings upon them?—It would assist us very materially there is no doubt, and I think it would be very much better if arrangements could be made with large towns and county boroughs—for the Government upon some terms to try and complete the map on a decently large scale within the city boundaries.

4331. Where a district is going to be immediately built over, which is where you want the large-scale map, is it worth while to put on the large-scale map the details of fields and buildings that are about to disappear, provided that the triangulation is sufficiently small to enable you to put what you want on it?—I do not think it would be.

4332. (*Mr. Roby.*) With regard to portions newly added to the city, do not you think a 25-inch scale would be practically sufficient for your purposes?—Yes, that would answer for a considerable time.

4333. (*Mr. Mather.*) Probably you would not have asked for the survey from the Ordnance Department, which is to cost 7,000*l.*, if you had had a complete 25-inch map?—I do not know that we would. You see, the advantage of this map is that even although we have not the larger scale, we can always take a piece out of the map and photograph it three or four or five times the size, and use it without making a complete survey.

4334. (*Chairman.*) I understand within one year you will have your 25-inch map for the whole of the city?—Yes, and it is a very useful map.

4335. And that would render it unnecessary to survey on the 10-foot scale all your municipal boundaries except where they are actually built over?—I think it would until the land was built over.

4336. And when a portion is going to be built over you would be satisfied to have the smaller triangulation set out for you so that you could fill in between the points with your buildings?—No. I think that the Government should really go further than that; when a place is being built upon or after being built upon, they should, as they have done in the past, make a complete survey of that district themselves, so that they may have it all upon the same basis, and then allow the municipality to fill in afterwards in the manner I have indicated.

4337. (*Chairman.*) You are not satisfied with your new 10-foot plan as to its style in comparison with the 5-foot map; your 5-foot map was an engraved map?—An engraved map, a beautiful map. I do not mean to say we require to have it so beautifully executed as that, but there is a very, very great difference between the two.

4338. Is there any actual inconvenience arising from the coarseness of the execution?—I think I have set it out in my written statement.

4339. "For correct measurements the outlines on the recent plans are much too heavy, and the hatching being also heavy, the details, figures, lettering, &c. are difficult to trace?"—(*Witness produced the phot zincographed map.*)

4340. You think the outlines of buildings are a little too heavy?—Yes.

4341. Do you think it is necessary in order to indicate the buildings that they should be bounded by so thick a line as appears on your plans?—I do not think

Mr. J. Allison.

15 June 1892.

Mr. J. Allison. 4342. (*Lieut.-Gen. Cooke.*) Do you think it a positive disadvantage?—Yes, a positive disadvantage.

15 June 1892. 4343. (*Chairman.*) If the outlines of buildings were not heavier than the ruled line, would that be sufficient?—Yes, I think it would be.

4344. This plan is a ruled plan—a cross-ruled plan?—It is.

4345. Were you asked whether you would have a skeleton plan which could be coloured, or whether you would have a cross-ruled plan?—I do not remember being asked the question.

4346. (*Chairman.*) Which do you think is better; which do you prefer, a town map in two sheets, namely, a skeleton or outline like this one, which can be coloured after that fashion, but is published in two editions, or one like this (hatched) in one edition?—I should prefer anything almost to the hatched plan, as now published, because the hatching is so heavy; you have to use such heavy colours to kill it; but if you could get the hatching as light as this or as thin as that, I should prefer it to a skeleton.

4347. Would this outline map if cross-ruled satisfy you?—Yes, that is very much finer. I should like that if you could put in the hatching lighter.

4348. As an outline map is this inconvenient to use; it does not sufficiently distinguish the buildings from the yards?—It does not.

4349. And when it is coloured it makes the map so expensive?—Yes, it would be, because it would require two printings.

4350. (*Mr. Roby.*) It is hand-coloured?—(*Chairman.*) The difference in cost, you say, is this—this hatched sheet is 2s. 6d., and coloured it is 11s. 6d.?—I should prefer if we could get them finely hatched, to have no colour whatever, because for railway and municipal work and for other purposes people use the maps for their own particular case which they are getting up, and it does not do in all cases to have particular colours on maps.

4351. (*Lieut.-Gen. Cooke.*) Then you must bear in mind that you can get this in both forms, coloured or not coloured?—Still the coloured, you say, is much more expensive, and I say that expense is unnecessary, and if we could get this outline map finely etched it would answer all purposes, so long as we could distinguish the buildings better than we can now.

4352. You complain that the new map does not show the details which the old map did show?—In Manchester we have the South Junction Railway crossing the city upon a viaduct 23 or 24 feet high, crossing the streets at various points. You can see the arches and abutments are shown along here; and by looking at that map you can at once get the information that the railway is being carried across the town on a viaduct. Upon the new 10-foot map the railways are shown, but the mode of construction is not indicated.

4353. Is it very desirable that the arches of the viaduct should be shown where railways pass through towns on viaducts?—Yes, we show the straight line passing along there. This line passes over 25 feet above it, and the straight line is not even dotted through in all cases.

4354. You also mention that the interiors of public buildings are not now shown on the plan. Do you think that is necessary or desirable?—It makes a more complete plan, but I do not think it is necessary.

4355. Will you explain that on your plan?—I think the interior of a cathedral might be shown.

4356. (*Secretary.*) The interiors of cathedrals are still shown on the 1/500 scale?—I do not think it is an important point.

4357. (*Chairman.*) You are not aware apparently that you are going to have the 25-inch map?—I was not aware of it until this morning.

4358. That removes any remarks you have made upon that point?—I think perhaps before we pass from the underground work I might point out the underground course of a river. Here is the River Medlock coming down here. At this point (indicating) there is an underground culvert about 16 feet in diameter, and the whole river comes down, tumbles into this, and it is taken away from here and passes along into the River Irwell at another point. That is about 35 feet below the level of the street and all covered in. I think it is very important that an important river like

that should not be lost sight of upon a modern Ordnance Survey map.

4359. (*Mr. Mather.*) How do you show that the river is 35 feet below and arched over?—There is nothing to show it on this map. It is missed out entirely. What is known as Hoyles Tunnel would be about 450 yards long. It is shown on the old map and left out on the new map.

4360. What is true of the Manchester modern map will apply all over the kingdom. Is it a very important omission?—Yes.

4361. (*Secretary.*) It was decided the tunnels should not be shown on the 1/500 plans because it frequently occurs that they run through a number of plans, and the existence of dotted lines running through a number of plans was found to be confusing. Probably another reason for the omission was the difficulty of showing these underground works with the accuracy required on the Ordnance Survey plans?—In our case there would be no difficulty as to that, because we have correct surveys of all the rivers throughout the city.

4362. But the Ordnance Survey would have to re-survey it, and to survey an underground river with the accuracy required on the Ordnance Survey at all events would be a matter of extreme difficulty, and it is obvious that if done at all, it must be done with extreme accuracy, because an error of a few feet one way or the other would be of great importance?—Quite so.

4363. (*Chairman.*) A tunnel of that kind could only be surveyed by sinking shafts?—It could only be surveyed by shafts.

4364. (*Lieut.-Gen. Cooke.*) Is it not traversable by boats?—Scarcely.

4365. (*Chairman.*) With regard to price, you think the price of the 6-inch and the 5-foot map is reasonable, but the 10-foot map is too dear?—I think there is so little upon the 10-foot map, and as the greater part of the expense is upon the survey and the plotting, I think it is expensive in proportion to the others.

4366. You get so small an area for your money?—You do.

4367. You are of opinion that trees and paths in gardens might be omitted with advantage from the Ordnance survey?—I do. I think it is quite unnecessary. Great expense is involved in surveying and plotting them, and I think that no useful purpose at all is served.

4368. As regards the agricultural districts, you would keep the trees in?—I would in many cases, because when you get into the open country it is useful. I have known myself, when one gets into the centre of a large field, you have really no means of ascertaining the exact position in which you are standing without referring to a map, and unless you can get a land mark upon the map you cannot locate yourself at all.

4369. Are you satisfied that the trees in the hedgerows are so correctly surveyed on the Ordnance map that you could use them as points?—Not for setting out, but for casual observation.

4370. (*Mr. Roby.*) Should you require the trees to be distinctly surveyed, and their position accurately determined, or would you be satisfied merely with a general indication of trees?—The principal trees you would either have to correctly delineate upon the plans or leave them out altogether, otherwise it would be worse than nothing.

4371. (*Sir A. Gekie.*) I understand you to refer now to individual trees. Where there is a hedgerow would you be satisfied with conventional trees? Yes, entirely. I am speaking of a field of 100 or 150 acres, where you have no key to your position when you get into the centre of a field except a tree here and there. I think it is important in a case of that kind that they should be shown.

4372. (*Mr. Roby.*) What about trees in hedgerows?—I do not think it is at all necessary to indicate them.

4373. But the isolated trees in fields should be placed as they are at present?—I think it necessary they should be shown.

4374. (*Mr. Roby.*) Do you think trees are sufficiently permanent to entitle them to a place on the Ordnance map?—I think so in agricultural districts. They are sufficiently permanent for 30 years—any way before your next revision.

4375. I should just like to ask you with regard to the paper on which the maps are printed. Do you like the

present style of paper?—I do not; I was going to name that. It is very brittle; it has a rough surface, and you cannot keep it clean anything like so long as you could the old sheets. The old sheets were very superior in every respect.

4376. (*Chairman.*) That is the paper on which your town map is?—The paper on which the 5-feet plan is published; that is satisfactory.

4377. The paper on which the 10-feet is published is unsatisfactory?—Yes.

4378. (*Mr. Roby.*) Should you tolerate a sheet like that (Evans's thin tough paper)?—For the larger scale plan I do not think it would be desirable to have a very thin paper.

4379. Do you mount your plan usually?—Generally we do. A thin paper would answer for that purpose.

4380. Do you make many erasures?—Well, of course we are bound to do that in keeping up a plan, and for that reason the thicker paper, as shown with the 5-feet would answer the purpose much better than the thin paper. You could not erase upon this at all. If you look at this paper here, and compare it with this old 5-feet plan you will find it gets dirty very soon. There is no face upon it.

4381. Your opinion is that for a town map you require a sort of drawing paper?—Yes, if you have to keep up the maps upon that. You are bound to have a good many erasures, which you cannot carry out on thin paper.

4382. (*Mr. Mather.*) You have said that the execution

The witness withdrew.

Mr. EDWARD RYDE called and examined.

4389. (*Chairman.*) You were President of the Surveyors Institute some years ago?—I was. I was the president to whom the Queen granted the charter.

4390. Was that in 1882?—I could not answer as to dates.

4391. In 1882 you read a paper on the Ordnance Survey?—I did.

4392. Have you referred to what you read on that occasion?—No, I have not; but I have it all in my head, I think.

4393. Since 1882 the Ordnance Survey has made great progress?—Yes.

4394. Your experience relates more to the 25-inch, the 6-inch, and the 1-inch maps than to the town maps, I suppose?—No, I have had to use a large number of all of them. Liverpool is on the 10-feet scale. I have used that very much in the last six months in a matter connected with Lord Derby's estate, and a very fine survey it is.

4395. Is the 10-feet map of Liverpool satisfactory?—I should think so, but of course I have not in any way tested its accuracy. It is a very useful map indeed.

4396. When you get one of the Liverpool maps, do you get it coloured or uncoloured?—We try to get them uncoloured, because always, when I use a map in my office, it is for a special purpose, and we like to colour our own maps to suit our reports.

4397. When the sheets are coloured they are very expensive?—They are more expensive.

4398. They become too expensive?—Not for my purpose, because I never use them, except it is for a professional matter which will bear the expense of the Ordnance maps at all events.

4399. For the ordinary map the skeleton form—the uncoloured form—is not a satisfactory form?—I suppose not. People unaccustomed to use maps prefer coloured maps, I dare say.

4400. Would you like to have only one edition cross-ruled?—That is with all the buildings hatched, you mean? I think that would be a satisfactory edition, a satisfactory map. There would be only this objection to it, that a building very often gets pulled down, and has to be erased from the map. We have so much more erasure to make if we have all these hatches to take out. For my (surveyor's) purpose we do not want buildings either hatched or coloured; we can do that ourselves in our own office.

4401. If that were all cross-ruled would that seriously inconvenience you for your surveyor's purpose?—Only to the extent I have mentioned, that if we want to

of this new map, the 1/500 scale, is in your opinion discreditable?—It is, I think.

4383. Would you, as an engineer and surveyor of the city of Manchester, on behalf of your profession, say the Government ought at once to improve the execution of this map?—I think they will do so.

4384. You think for practical purposes—for your own purposes—it is better to have a better executed map?—Yes; to have a better executed map, and also for appearance.

4385. For practical purposes do you think there ought to be more detail shown of the character you have described in reference to the older map, on the new map?—Yes; I think so. I do not think you require more than what I have set out in my report; but what I have asked you to omit, such as gardens, trees, and shrubs I think would be rather an advantage if omitted than otherwise.

4386. In a word, then, you consider the present map, the 1/500 scale-map, is an imperfect map for your purposes as a city surveyor?—It is; the very appearance of the map does not give one confidence of its being a correct map.

4387. Do not you think the general public would be quite as well satisfied with a nicely hatched map as you are as surveyor?—I have said so.

4388. The general public would not prefer a coloured map like that to the hatched map?—I think not; I think for towns, perhaps, I should prefer them without colouring at all if we could get a finely hatched map.

remove a building we should have more to take out than we have now.

4402. (*Mr. Roby.*) In regard to the outline, can you always clearly distinguish between building and yard?—We cannot tell by merely looking at the map always, at all times.

4403. (*Chairman.*) This map is cross-ruled; is that map satisfactory, in your opinion?—Yes, quite. Do you mean to the public, as compared with the coloured map?

4404. Yes?—I should prefer this (the hatched map) to the coloured map.

4405. As a surveyor, do you say that is sufficiently fine in its work?—Do you mean as regards the mere drawing, or that there is sufficient detail?

4406. I mean as regards the drawing?—Oh, yes.

4407. (*Mr. Mather.*) Both the outline and the hatching?—Yes, if we wanted a better map than that we should draw it by hand.

4408. (*Chairman.*) Do you think a town surveyor should be satisfied with a map as well drawn as this?—Yes; if he does not get one so well drawn he makes it himself at his office.

4409. It is represented to us that this cross-ruled by zincography cannot be done finer?—Well, that I cannot say.

4410. Is the map prejudiced by that amount of coarseness?—Not a bit. Of course we do not buy these as pictures.

4411. (*Mr. Roby.*) The statement made is that when the hatching is as coarse as this it is difficult satisfactorily to cover it with colour for your own purposes?—That is nonsense. I have got a man in my office who will colour it with any colour you like.

4412. (*Chairman.*) Do you like thick lines to the buildings?—Well, as a man gets older the lines seem to get smaller.

4413. Do you like the buildings with thicker lines on one side than on the other?—Yes, I think that shows which is a building. I think that is of importance, but I do not think it is essential. If you are going to scale from it, of course the thick line is not so good as having all the lines uniform.

4414. (*Chairman.*) With regard to the 25-inch, you have found that an accurate map?—Sometimes. They are not at all times; but then nothing is accurate at all times. Generally speaking, it is a very good map. I find very great variation in the 25-inch maps as to the style of execution; some of them are much coarser than others. That is a mere matter of printing, I suppose.

Mr. J. Allison.

15 June 1892.

Mr. E. Ryde.

Mr. E. Ryde.

15 June 1892.

4415. In any particular district?—I could not tell you the district now. We use a large number of the 25-inch maps.

4416. (*Sir A. Geikie*.) I understood you to say just now you were not satisfied always with its accuracy. Could you mention any cases where you found the map to be inaccurate?—I could not now without reference. I could find you cases no doubt where the map was inaccurate, but then you know that is due to an error in the drawing of the map originally.

4417. (*Sir A. Geikie*.) By inaccurate, you mean a little mistake, not an omission?—No, I mean that a fence or a line upon the map is out of position.

4418. (*Lieut.-Gen. Cooke*.) Have you found many errors, taking into consideration the large number of maps that have gone through your hands?—I do not think I have. You know with regard to the 25-inch map there is a good deal of difficulty in using it in the counties, because it is not the boundary of the property that is shown upon the map.

4419. (*Chairman*.) The boundary which is shown on the map is the medial line of the fence?—Yes, and you know how the fences vary.

4420. Could you, as a surveyor, suggest any better mode of defining the area than by the middle line of the fence?—What I do suggest, I think even in the paper which I read at the Institution, is that there should be a second line upon the map which should indicate the boundary of the property, say the outside edge of the ditch. In nine times out of ten or 99 times out of 100 the bank and ditch belong to the field to which they do not appear to belong. The ditch is not in the field to which it belongs. It is obvious that a man who has got to fence his own land must dig his own ditch upon his own land; therefore the ditch must necessarily be outside the bank.

4421. Would it not confuse the maps a great deal to indicate the edge of the ditch?—Of course; it would make another line, and to people not accustomed to the use of maps probably there would be some confusion; but for estate purposes we have to make that addition.

4422. When you survey an estate for private purposes, do you show the ditch on your drawing?—We show the outer edge of the ditch and nothing else.

4423. And not the fence?—You asked me "when you survey." There are no surveys made now. It is always the Ordnance map doctored up in some way or another.

4424. As for instance, the tithe map?—The tithe maps which I have made (and I have made a very large number) all show the outer edge of the ditch as the boundary of the field.

4425. And not the fence?—Not the fence at all unless it were a timber fence, a pale fence, then there would be no ditch generally speaking.

4426. (*Mr. Roby*.) Before you put on the map that outer edge, did you examine as to the question of property?—I always surveyed that outer edge and I never put any other line in my field book than that outer edge.

4427. That would be indicated by a dotted line, I suppose?—No, a hard line as if it was a fence. You have in this office a map of the parish of Sunbury which was one of the best maps I ever made, and also a map of the parish of Horsell which I made, and that was also a very good map; the Sunbury map was sent back by Major Dawson, who said he did not want a fair copy, but he wanted the original map to test.

4428. (*Mr. Mather*.) Would your line there showing the ditch be regarded as the legal boundary of the estate?—Yes, and all through most of the counties of England that is the boundary. The only question is, how far that is from what is called in some counties the "growers," in others, the centre of the hedge, in others, the stem of the quick. The only question is whether it is 3 feet, 4 feet, or any other measure. A practical man can determine by mere looking at it where the boundary is, at all events as near as it can be determined.

4429. (*Lieut.-Gen. Cooke*.) It is a very easy thing when you have the fence laid down as it is on the Ordnance Survey map to run the line of the actual boundary?—I am not referring to that map.

4430. (*Chairman*.) I will read you what you said: "In fact, another line might be delineated upon the

"plan denoting the real boundary of each enclosure. "No objection could be taken to this work being done "by contract and by local men; all that will be "necessary would be to obtain the width of the half- "bank and the ditch, and to delineate it upon the "map upon its proper side of the published line. A "separate issue of maps with this additional infor- "mation upon them could be made and a remunera- "tive extra charge would be submitted to by those "to whom the addition would be useful." Now with regard to trees?—I heard what the last witness said about trees. I think they should only be surveyed if they are isolated.

4431. Not in the hedges?—No; they might be surveyed when they are in the centre of a field. No surveyor ever uses a tree as a point of position. As regards trees in hedge rows, I do not think it is desirable to show them at all. All through my county the landowners have been cutting down the timber very much indeed during the last two or three years. Where you show large hedgerow timber upon your Ordnance map it is now all gone.

4432. (*Mr. Roby*.) What county is it?—Surrey.

4433. (*Chairman*.) You would omit all trees in hedgerows?—Yes; I should not show them at all.

4434. Would you show isolated trees in parks?—I should indicate that it was a park.

4435. That there were trees about?—Yes; I should not attempt to plot them.

4436. You would not survey the trees?—No.

4437. (*Mr. Roby*.) Any large and fine trees which seemed to be used as landmarks I suppose you would put in. On my own land I had three very fine large timber trees blown down this last winter. They were blown down; they are gone altogether. Those elm trees have stood there in my recollection between 60 and 70 years, but they are gone now.

4438. (*Mr. Mather*.) You would show an avenue of elms or beeches?—Yes.

4439. (*Mr. Roby*.) Conventionally?—Yes.

4440. (*Chairman*.) When the maps were first published all the plots were numbered, and an area book was published?—Yes.

4441. Now a new system has been adopted, the area books are abolished, the areas are retained and the numbers are stamped on the plots?—Yes.

4442. Which do you think the better plan?—I think the better plan is to stamp the numbers on the plots. The area books were frequently missing when they were wanted.

4443. The area being on the plan, do you think there is an advantage in having a number there also?—Yes. I think so for this reason: you want sometimes to describe the position of land or its general position in a parish, and you can say it is such-and-such a plot and numbered so-and-so on such an Ordnance map. I think that is useful.

4444. You are aware that these numbers are occasionally entirely altered?—I was not aware of that. If that is so that would be an awkward business.

4445. Does not that remove the utility of the numbers?—Yes.

4446. (*Mr. Roby*.) Unless you identify the particular map by the date?—I was not aware that they ever were altered.

4447. (*Chairman*.) There have been numerous cases in which parish boundaries have been altered and that has entailed an entire renumbering of the parish. The consequence is that one edition of a map has such-and-such numbers while another edition has totally different numbers?—I was not aware of that; that is a very confusing matter no doubt, and I should not have so altered it. I should have thought you could have altered your numbers sufficiently to meet the alteration of the boundary by the use of the letters A, B, and so on.

4448. (*Mr. Mather*.) If every sheet had a date to it you could identify that number by the date of the sheet?—Yes.

4449. That would meet your difficulty?—You would have to add the date.

4450. (*Chairman*.) Here (*showing a plan*) is a small specimen of an actual difficulty which has arisen, showing how difficult it is to retain the numbers?—I

know a place very much like this on the boundary between the parishes of Weybridge and Byfleet.

4451. Would it be practicable in the revision of this map to retain the numbers even with the help of letters, A, B, &c.?—I do not see how you could do it without having new numbers, but you would retain the position of all the old numbers. Of course you cannot make changes in the land without making some alteration on the map.

4452. (*Chairman.*) That difficulty having been pointed out do you think it is necessary to retain the numbering of the plots considering that the areas are now printed?—I think that the numbering is very useful. For instance, if I were going to describe the commencement and termination of a new railway I should say it begins in field numbered so-and-so on such-and-such an Ordnance map, and terminates in field so-and-so, in such a parish, numbered so-and-so on such-and-such an Ordnance map. That is a very useful mode of description.

4453. (*Lieut.-Gen. Cooke.*) Why should not you describe it as a field having such-and-such an area on the Ordnance map? No two areas agree?—Yes, they do sometimes.

4454. They could not agree with three decimals. You would never have 15·235 twice on the same plan. If you did you could put a different letter on it?—Your other suggestion is that you should put number so-and-so on the Ordnance map dated so-and-so. Then you put to me whether it is better to number them on the plans. But when we make use of Ordnance plans to a large extent all these margins are cut off and the maps are mounted up together, and if you had separate numbering on each plan you would have a lot of numbers conflicting with each other.

4455. It would save the Ordnance Survey an enormous amount of expense, time, and labour if these numbers could be done away with?—If that is so, I do not think the numbers are sufficiently useful to justify a very large extra expenditure.

4456. (*Chairman.*) At every revision the numbers will largely be changed so that they cease to be monumental?—If the map is to be, as I suppose it is to be, a cheap publication, I do not think the numbers are of sufficient importance. I think the areas on the fields will do.

4457. (*Lieut.-Gen. Cooke.*) There is one great disadvantage in numbering by parishes. Supposing you have 15 plans of the parish. You cannot complete one sheet until you have the whole of the rest of the parish arranged. You have to arrange them all as one, and the inconvenience caused by that is something enormous?—Yes.

4458. (*Chairman.*) Have you any experience of the use of the 25-inch maps for assessment purposes?—Yes, very large.

4459. In what parish?—In almost every parish that I have been connected with since the 25-inch map has been published. We always use it, and we use it very largely now in the united parishes of Plymouth.

4460. Does the assessment committee at Plymouth use the map themselves, or does the surveyor use it?—We made an entirely new valuation of the borough of Plymouth about seven or eight years ago, and revised the map.

4461. And prepared the valuation list for the overseers?—Yes; it was a very large business.

4462. Do you use the Ordnance Survey numbers as the numbers for the valuation list?—No; where there are houses in streets we use the street numbers very largely.

4463. Is it not the case that a valuation list has to be numbered from the beginning to the end right through?—It is the case that the overseers do it for their own purposes; we as surveyors do not do that.

4464. You do not prepare the valuation lists then for the overseers. You prepared the valuation, not the valuation lists?—Yes, we did; we prepared the valuation lists. The rate book is a copy of the valuation lists.

4465. But with the same numbers that are in the valuation list?—We had no numbers. I think I am right in saying that the collectors numbered the ratepayers. It is a numbering of the ratepayers—rateable hereditaments.

4466. The first column of the valuation list you as surveyor did not fill up?—No.

4467. Might it be desirable for valuation purposes to fill up that first column from the numbers on the Ordnance survey?—No, I should think most undesirable, because one assessment in that valuation list might include any number of numbers on your Ordnance map. It might include a farm of 30 or 40 fields, or a hundred fields perhaps, each of which would have a number on the Ordnance map, or it might include a house and yard behind, which yard behind might have a separate number on your map, but it would be included in one number with the house in the rate book.

4468. Therefore, for the purposes of local assessment, the numbers on the Ordnance map are not of any service?—I do not think they are of any service.

4469. The way in which you have used the maps for assessment purposes is to indicate clearly which property you are assessing?—Yes, and its boundaries.

4470. (*Mr. Roby.*) And the acreage?—We have used the acreage; yes.

4471. You accept the acreage?—Yes, for that purpose—for assessment purposes.

4472. (*Chairman.*) Then, for valuation purposes, the Ordnance map is chiefly useful as an index to show precisely what is the property the valuer is dealing with?—A man cannot make a valuation of property properly without a map. He must see where the property lies. A map is most useful and most necessary.

4473. Have you any observations to make on the 6-inch map?—No. I am a little disappointed with the appearance of the 6-inch map now that it is not engraved. The old 6-inch map was a beautiful work of art. These published now are not nearly so good.

4474. Are not they good enough?—Yes, I think perhaps they are.

4475. (*Mr. Mather.*) Are you familiar with the map of the towns published in 1845, the one referred to by the last witness?—The 5-feet map.

4476. Yes; are you familiar with its execution?—London is a 5-feet map?

4477. That is the engraved map. You made some comments a little while ago on the execution of the present 10-feet scale map. You did not praise it much, but you said it would do?—I said the map of Liverpool was a beautiful map which has just recently been done. I have had a matter to do in connexion with Lord Derby's estate, and I have used those maps in large numbers, and they are very fine maps.

4478. (*Chairman.*) Your objection to the 6-inch map is that it is not so good as it used to be?—Yes; I can speak especially of the map of Liverpool, because I have been using it.

4479. Has your attention been drawn to the 1-inch maps of the new survey?—Yes, the new series.

4480. Are you satisfied with them?—Not altogether. I want to make some suggestions about them. They show what are mere footpaths in many places as broad roads, and looking to the map you would think that if you were driving through the country you could drive along that road. I will deal with my own place at home. First of all I have some land in the parish of Windlesham, close to Bagshot, which is very pretty heath-land, and there are innumerable tracks across the heath. Workmen living out on the common, before the soldiers came there so much, in going to and from the town of Bagshot would soon make a track. If their work shifted they would make a fresh track, and the old one would grow out in a short time. The Ordnance Survey have shown all these tracks on their maps. I think every one is on the survey.

4481. Not by double lines?—I will not say whether by double lines or whether by single, but they have shown them on, and the public claimed to have a right to go across there, and several landowners have fought the matter out.

4482. Has your attention been drawn to this note: "The representation on this map of a road, track, or footpath, is no evidence of the existence of a right of way"?—I have seen that on several maps.

4483. Is not that sufficient?—It is sufficient for the local bench of magistrates, where you get in the first instance if you get into litigation with these fellows.

Mr. E. Ryde.
15 June 1892.

4484. You would suggest that the delineation of these footpaths should not be continued?—I would suggest that mere tracks across heath-land should not be shown unless there was a public footpath.

4485. How is the Ordnance surveyor to know whether it is a public footpath or a private footpath?—It is difficult, no doubt, and if he is told to show every physical feature of a country there is a difficulty.

4486. Do you think you could draw up any instructions which would obviate the difficulty you mention?—I think one day spent in a parish by a man of sufficient intelligence would be enough for him to ascertain which are public footpaths and which are not. I am not saying that in a case of doubt he should decide that; here he must give the public the benefit of the doubt.

4487. In case of doubt would he not in all probability be told according to which person he happened to meet that a particular footpath was a public footpath or it was not?—In this particular case which I refer to in the parish of Windlesham the title is an award under a public inclosure Act of about 1805, and there by the plan, all the public footpaths are set out and marked, and not one of these that are marked on the Ordnance map is set out.

4488. Is it not possible that since 1805 a footpath may have become public by constant user?—Well, it is possible, I dare say.

4489. (*Mr. Roby.*) In the case of the particular footpaths that you speak of, which you do not consider to be public rights of way, are there any gates or stiles?—No; they get over a bank and ditch.

4490. Are there any gates or stiles regularly made for the purpose, so as to indicate a footpath?—None whatever; people have to get over a bank and ditch.

4491. You think that greater caution in indicating footpaths might have been used by the Ordnance survey?—Yes; I think that is a very good way of putting it.

4492. (*Chairman.*) With regard to your remarks about footpaths being indicated by double lines, I put into your hands the sheet of characteristics showing how footpaths ought to be shown?—Few of the public ever see these sheets or ever know of their existence. I may remark that when I made maps I always used to show my footpaths by a series of little marks or dots.

4493. There are dots on the characteristic sheets?—Yes; but they are rather close together, and there are

a good many of them. If half those were left out, or two-thirds, I think that would do.

4494. You think, as a surveyor, the footpaths would be better shown by dots placed further apart than they are at present?—I mean all the footpaths across arable fields and meadows.

4495. I will draw your attention to the roads. Looking at this sheet of characteristics, would it be well to amalgamate the two first classes of roads: One is called turnpike and main road and the other is ordinary metalled road, and a third is minor road?—The first two might be amalgamated. There is the main road under the county councils. The turnpike has now become the main road, and there are other good roads that were not turnpikes.

4496. Every road that is capable of being easily driven over with a carriage ought to be included in the same category?—Yes, that is what I think.

4497. Then if you show in addition to the roads in that category a minor road, such a road as you would use only for farming purposes, that would be sufficient distinction?—Two classes of roads would be quite sufficient, and if it was only a footpath I would only have some small dots.

4498. Do you think it would be practicable for the map when in proof to be looked over by local people with a view to such corrections as you are inclined to suggest?—This was never suggested to me before; but in the same way you do parish boundaries, you might deposit a plan and give notice, and I suppose there would be no great difficulty and not much expense.

4499. You would suggest that if you could get any local person who would take the trouble it might be desirable to get the proofs looked over locally?—I am quite aware of the difficulty, but in our case, for instance, one of my sons would do it—would go and look at it as a matter of interest, I mean.

4500. He would probably be able to form a sound judgment for 10 miles round your house?—So he would for 30, I should think; but you must not make a circle, because there are of course parts they do not go to.

4501. It would be an additional protection against errors?—Yes, but in a populous place like Woking is becoming there will be a large number of people who will take the trouble. For instance, we have several Royal Engineers officers now living at Woking; I do not know whether they would be disposed to take any trouble about it.

The witness withdrew.

Mr. C. Tomes.

Mr. CHARLES TOMES, Borough Surveyor of Eastbourne, called and examined.

4502. (*Chairman.*) Eastbourne is a rapidly growing place?—Yes; a wonderfully growing place.

4503. Have you a 10-feet map?—Yes; I have a 10-feet map.

4504. You mean the Ordnance map?—Yes; all we could get of it.

4505. Are you a municipality?—Yes.

4506. How much of your municipal area does the map cover?—About two-thirds of it.

4507. Did you pay anything to the Ordnance Department for getting that map?—We purchased it of course in different sheets.

4508. That is not what I mean; did you pay anything for the survey?—No.

4509. Had you any difficulty in settling how much of your area should be surveyed?—No; we have had no difficulty of that sort; and there has been no survey since 1875.

4510. Are your buildings extending beyond the boundary which is surveyed on this large scale?—In many places.

4511. Have you got a 25-inch map?—Yes.

4512. Have you made any application to the Ordnance Survey Department to extend your 10-feet map?—No; I have not made any application, for this reason: that I have got a good deal of it up myself with my staff.

4513. You have extended the survey?—I have extended the survey as far as all the roads go.

4514. Have you had any difficulty in extending your survey?—Not the least; it has been a lot of trouble, but of course it was necessary for the purposes of the borough.

4515. The required trigonometrical observations have all been taken by yourself?—Yes.

4516. And satisfactorily?—Yes; as far as I know.

4517. Your map then is rather out of date now?—It is out of date; it is all covered and done with.

4518. It is very desirable that that map should be more closely corrected by the Ordnance Survey than it is now?—Quite so; it should be so.

4519. Would it be possible for you to submit every year a tracing on the scale of the Ordnance map, showing alterations which have been made, to the Ordnance Survey?—Yes; that could be easily done.

4520. In your opinion would there be any objection to that being a legal liability imposed on you?—No; I should not think there was any objection; I should think it would be an improvement rather.

4521. There might also be a legal liability on the Ordnance Survey, that having received those plans from you they should send an examiner down to test them, and that having so done they should supply a manuscript copy to anybody requiring it on payment, and that at the end of a limited number of years they should embody all those alterations in a new edition?—Quite so; I think such a system as that would answer remarkably well.

4522. That would save a great deal of the expense which is now incurred, and make your maps much more serviceable?—Quite so.

4523. Do you think there would be any objection on the part of the municipal authority to having that legal liability imposed upon them, apart from the expenditure which it might create?—I could not answer for the corporation, whether they would be satisfied with paying assistants to do that, or whether some fee should not be allowed for doing that sort of thing.

4524. (*Mr. Mather.*) Would it be a large expenditure, taking your own experience as a guide on this question?—Yes, a very large expenditure.

4525. From year to year adding the houses and the streets?—As we are at present going on, it would be a very large expenditure. We put up something like 200 or 300 houses a year.

4526. (*Chairman.*) Do you think you ought to keep up the town map yourself?—I do keep up the town map and the blocks of houses, but I do not keep it up in the same manner that it used to be kept up with footpaths, garden-paths, trees, and gulleys, and all that sort of thing.

4527. You have not brought a sheet of your town map with you?—No, I have not; but all ornamental gardens and that sort of thing I have got reduced on my map to correspond with the maps purchased from the Ordnance.

4528. That large 10-foot map is mainly useful for local purposes?—It is very useful for local purposes.

4529. The nation as a whole has no particular interest in a map on so large a scale?—I should think not.

4530. All national requirements are met by the 25-inch map?—Yes.

4531. I put it to you whether it would not be a fair charge on a municipality that they should bear part at all events of the cost of maintaining the municipal area, the large-scale map?—I do not suppose there would be anything against that. We have as surveyors to keep certain plans and we must keep plans, so that our counsel can refer to these plans and see what they are going to do.

4532. You would of course like as a municipality, or as borough surveyor, to be able to buy at the Ordnance Department a correct map?—Certainly.

4533. Instead of a map 15 years old?—Exactly so.

4534. (*Sir A. Geikie.*) May I ask if the map you keep up is in the same detail as the Ordnance survey?—Just the same detail. In fact I get sheets the same as the Ordnance survey is made upon. We get them at Stanford's and have them made on the same sheets.

4535. You say the building plans as they are given to you?—Yes.

4536. Sometimes the houses are not correctly laid out on the building plans?—I survey them.

4537. (*Mr. Roby.*) After the buildings are erected?—After the buildings are erected.

4538. What do you imagine the cost is of keeping up your map?—I could not tell you. It comes in the general work, and when the clerks have nothing else to do they go on with that.

4539. (*Mr. Mather.*) Is it 500l. a year?—Oh, dear no; nothing like that. *Mr. C. Tomes.*

4540. (*Chairman.*) Do you think your practice is a general one in regard to keeping up the maps?—I cannot tell you. 15 June 1892.

4541. Do you happen to know anything about Hastings?—I do not think Hastings keep theirs up the same. I do not think the map of Hastings is brought up to date.

4542. (*Mr. Mather.*) It would not cost the Corporation of Eastbourne anything like 500l. a year if they supplied this information to the Ordnance Survey Department?—No. I think the Hastings and Brighton people make a map of their own to their own scale and work to it. We are content with the Ordnance scale.

4543. Why should they make a map of their own when they have a 10-foot map. Is not a 10-foot map good enough?—I should think it was too good.

4544. (*Chairman.*) With regard to the character of your 10-foot map, is that satisfactory?—I think there is too much of it.

4545. Have you the map in skeleton and coloured?—Yes; the coloured one is the same as the Liverpool sheet (indicating). There are lots of things in our district that might be omitted, such as the footpaths round gardens and shrubberies in gardens.

4546. There is too much detail?—Too much detail by a long way. It comes in the way.

4547. The skeleton or outline map is cheap enough, I suppose?—Yes.

4548. But it does not afford to the general public a satisfactory indication?—It does not afford to us the means of carrying the work on, as people are unable to understand it.

4549. The outline of the building is not sufficiently indicated?—No.

4550. When it is coloured it is sufficiently indicated, but it becomes an expensive map?—Yes.

4551. Would it satisfy you if instead of those two forms it was produced only in one form cross-hatched?—Yes, that is what is really necessary.

4552. Would that map (cross-hatched map of Manchester) satisfy you?—That is very satisfactory.

4553. Is that too coarse in drawing to satisfy your requirements?—I think that is just the sort of map we want in towns. Houses are mostly built in blocks. In our case there is a large quantity of garden with them.

4554. (*Mr. Mather.*) Yours is a residential town, of course, not like Manchester?—This (map of Manchester) is a very good idea altogether.

4555. (*Chairman.*) Is the outline of the houses there too coarse?—I do not think so. I should think it is a very good sample.

4556. You think you could measure with sufficient accuracy on that?—I think so.

4557. (*Lieut.-Gen. Cooke.*) Would you prefer not having a black line on that side?—No; I think that is rather important.

4558. It does not interfere with the accuracy of measurement?—Not at all.

The witness withdrew.

Major DUNCAN JOHNSTON further examined.

4559. (*Chairman.*) Referring to the evidence of Mr. Allison this morning, the Committee would like you to obtain a report from Southampton as to the possibility of remedying the defects pointed out by Mr. Allison as regards the coarseness of detail produced by the cross-ruling in town maps similar to those in use in Manchester?—It would take a very long time to experiment upon a different method of cross-ruling, because the cross-ruling is from a specially-prepared copper-plate, and the expense of preparing a copper-plate is very considerable and the time also is considerable.

4560. (*Sir A. Geikie.*) Could you show us a small map with the lines in skeleton, and then the same map after it has had the hatching, so that we might compare?—Yes.

4561. (*Chairman.*) Is this hatching done by the same printing as the outline?—Yes, but the detail is first

transferred to the zinc, and then the hatching. That introduces the further objection to hatching, that before the ruling is transferred we have to do what we call "stopping out"; that is, all the detail to which it is not intended to transfer the hatching is covered with a gum solution. The gum solution is not very visible on the plate, and it will frequently happen that it will come a little over the lines (it is impossible always to prevent it), and there will be an unsightly break in the hatching; in another place will be left uncovered a place which ought to be covered.

4562. Then all these streets are "stopped out"?—All except the houses is stopped out. With the engraved plate, of course, it is engraved once for all.

4563. (*Lieut.-Gen. Cooke.*) Have you tried to do it by machine?—We have a ruled copper plate about quarter-sheet size; we have to take our transfer, cut it into bits, and piece it to the different maps, before the

Major D.
Johnston.

Major D.
Johnston.

15 June 1892.

ruling can be transferred. It would take far longer to rule each plate even if we had a machine large enough.

4564. The ruling would be much finer if you can do it by machine?—We should first have to get the instrument, and the expense of ruling it in that way would be greater.

4565. Greater than all this stopping out on the transfer; I know a machine was tried, at all events?—That was for doing the engraved work.

4566. The 1-inch is ruled, is it?—Yes, by machine.

4567. On this 10-foot map how close do you suppose you can measure?—To half a link.

4568. Four or five inches; then the thickness of a line is not important?—The thickness of line is not important at all, because it is well known that the outer edges of the line show the extent of a building. The centre of line shows the centre of a hedge or fence.

4568a. (*Witness continuing.*) Mr. Francis Galton has been invited to give evidence, and he wishes to put in part of an address which he delivered before the Geographical Section of the British Association as evidence; he says he has nothing to add to this, and he thinks it may be useful to the Committee.

4569. What is the date of this?—1872:—

“English geographers are justly proud of these Ordnance maps of their country, whose accuracy and hill-shading are unsurpassed elsewhere, though the maps do not fulfil, in all particulars, our legitimate desires. I shall not speak here of the absence from the coast maps of the sea data, such as the depth and character of the bed of the sea, its currents and its tides (although these are determined and published by another Department of the Government, namely, the Admiralty), neither shall I speak of the want of a more frequent revision of the sheets, but shall confine myself to what appear to be serious, though easily remediable, defects in the form and manner of their publication. It is much to be regretted that these beautiful and cheap maps are not more accessible. They are rarely to be found even in the principal booksellers' shops of important country towns, and I have never observed one on the bookstall of a railway station. Many educated persons seldom, if ever, see them, they are almost unknown to the middle and lower classes; and thus an important work made at the expense of the public is practically unavailable to a large majority of those interested in it, who, when they want a local map, are driven to use a common and inferior one out of those which have the command of the market. I am bound to add, that this evil is not peculiar in our country, but is felt almost as strongly abroad, especially in respect to the Government maps of France. I account for it by two principal reasons. The first is, that the maps are always printed on stiff paper, which makes them cumbersome and unfit for immediate use; it requires large portfolios or drawers to keep them smooth, clean, and in separate sets, and an unusually large table to lay them out side by side, to examine them comfortably and to select what is wanted. These conditions do not exist on the crowded counter of an ordinary booksellers' shop, where it is impossible to handle them without risk of injury, and without the certainty of incommencing other customers. Moreover, their stiffness and size, even when published in quarter-sheets, make them most inconvenient to the purchaser. Either he has to send them to be mounted in a substantial and therefore costly manner, or he must carry a roll home with him, and cut off the broad ornamental borders, and divide the sheet into compartments suitable for the pocket, which, to say the least, is a troublesome operation to perform with neatness. The other of the two reasons why the maps are rarely offered for sale, is that the agents for their publication are themselves map-makers, and therefore competitors, and it is not to be expected of human nature that they should push the sale of maps adversely, in however small a degree, to their own interests.

“The remedy I shall propose is the issue of the maps in quarter-sheets on thin paper, and to be sold, folded into a pocket-size, like the county maps seen at every railway station, each having a portion of an index-map impressed on its outside, to show its contents and those of the neighbouring sheets, as well as their distinguishing numbers. Also, I would ask that they shall be sold at every head post office in the United Kingdom. There are about 700 of these offices, and each might keep nine adjacent quarter-sheets in stock, the one in which it was situated being in the centre of the nine. An index map of the whole survey might be procurable

at each of these post offices, and, by a payment, any map not kept in stock might be ordered at any one of them, and received in the ordinary course of the post. This is no large undertaking that I have proposed. The price of a quarter-sheet in its present form, which is more costly than what I ask for, is only 1s., therefore, the single complete set of nine sheets for each office has a value of not more than 9s., and for all the 700 head post offices of not more than 320l.

“I believe that these simple reforms would be an immense public boon by enabling anyone to buy a beautiful and accurate pocket-map of the district in which he resides for only 1s., and without any trouble. They would certainly increase the sale of Government maps to a great extent, they would cause the sympathies of the people and of their representatives in Parliament to be enlisted on the side of the Survey, and they would probably be imitated by Continental nations.

“It has often been objected to any attempt to increase the sale of Government maps, that the State ought not to interfere with private enterprise. I confess myself unable to see the applicability of that maxim. It may be urged as an argument against making Ordnance maps at all; but the nation has deliberately chosen to undertake that work, on the ground that no private enterprise could accomplish it satisfactorily; and, having done so, I cannot understand why it should restrict the sale of its own work in order to give a fictitious protection to certain individuals against the interests of the public. It seems to me to be a backward step in political economy, and one that has resulted in our getting, not the beautiful maps for which we, as taxpayers, have paid, but copies, or reductions of them, not cheaper than the original, and of very inferior workmanship and accuracy.

“So much for the first of the two projects which I propose to bring before your consideration. It is convenient that I should preface my second one with a few remarks on colour printing, its bearing on the so-called ‘bird's-eye views,’ and its recent application to cartography. Colour printing is an art which has made great advances in recent years. In some cases maps receive no less than 24 consecutive impressions, each of a different colour from a different stone. This facility of multiplying coloured drawings will probably lead to a closer union than heretofore between geography and art. There is now no reason why ‘bird's-eye views’ of large tracts of country should not be delicately drawn, accurately coloured, and cheaply produced. We all know what a geographical revelation is contained in a clear view from a mountain top, and we also know that there was an immense demand for the curiously coarse ‘bird's-eye views’ which were published during recent wars, because even such as they are capable of furnishing a more pictorial idea of the geography of a country than any map. It is therefore to be hoped, that the art of designing the so-called ‘bird's-eye views’ may become studied, and that real artists should engage in it. Such views of the environs of London would form very interesting, and it might be very artistic, pictures.

“The advance of colour printing has already influenced cartography in foreign countries, and it is right that it should do so, for a black and white map is but a symbol—it can never be a representation—of the many-coloured aspects of Nature. The Governments of Belgium, Russia, Austria, and many other countries have already issued coloured maps; but none have made further advance than the Dutch, whose maps of Java are printed with apparently more than 10 different colours, and succeed in giving a vivid idea of the state of cultivation in that country.”

“I now beg to direct your attention to the following point: It is found that the practice of printing maps in more than one colour has an incidental advantage of a most welcome kind, namely, that it admits of an easy revision, even of the most beautifully executed maps, for the following reason: The hill-work, in which the delicacy of execution lies, is drawn on a separate plate, having perhaps been photographically reduced; this has never to be touched, because the hills are permanent. But it is in the plate which contains nothing else but the road-work where the corrections have to be made, and that is a very simple matter. I understand that the Ordnance Survey Office has favourably considered the propriety of printing at some future time an edition of the 1-inch maps on this principle, and at least in two colours—the one for the hills and the other for the roads.

“This being stated, I will now proceed to mention my second proposal.

"Recollecting what I have urged about the feasibility of largely increasing the accessibility and the sale of Government maps, by publishing them in a pocket form and selling them at the head post offices, it seems to me a reasonable question to entertain, whether the Government might not consider the propriety of making a reduced Ordnance map of the country to serve as an accurate route-map and to fulfil the demand to which the coarse county maps, which are so largely sold, are a sufficient testimony. The scale of the Government reduced map of France corresponds to what I have in view; it is one of 5 miles to an inch within a trifle, (1/320,000 of nature), which is just large enough to show every lane and footpath. Of course, it would be a somewhat costly undertaking to make such a map, but much less so than might at first sight appear. Its area would be only one twenty-fifth that of the ordinary Ordnance map, and the bill-work of the latter might perhaps be photographically reduced and rendered available at once. The desirability of maps, such as these, accurately executed and periodically revised, is undoubted, while it seems impossible that private enterprise should supply them except at a prohibitive cost, because private publishers would be saddled with the cost of obtaining afresh much of what the Ordnance Survey Office has already in hand. A Government Department has unrivalled facilities for obtaining a knowledge of every alteration in roads, paths, and boundaries of

common, and Government also possesses an organised system, in the post offices fitted to undertake their sale. The production of an accurate route-map seems a natural corollary to that of the larger Ordnance maps, and has been considered to be so by many continental Governments."

4570. (*Chairman.*) With regard to certain articles in the "Times" Major Johnston has something to report?—In consequence of two articles which appeared recently in the "Times" on the 4th and 10th June, I was instructed to write to the editor of the "Times" stating that if the writer desired to give evidence the Committee would be glad to receive it. I received this morning the following reply:—

"The Times,"
"Printing House Square,"
"June 14th, 1892."

"SIR,
"In reference to my reply of yesterday to your letter of the 10th instant to the editor of the 'Times' inquiring the name of the writer of certain articles on the Ordnance Survey, I beg now to add that I have communicated with the gentleman in question, and that he desires for personal as well as professional reasons to be excused from giving evidence before the Departmental Committee."

"I am, yours faithfully,
(Signed) A. F. WALTER."

"Major D. Johnston."

Adjourned till Thursday, June 16th, at 11.30 o'clock.

Board of Agriculture, 3, St. James's Square, S.W.

THIRTEENTH DAY.

Thursday, 16th June 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.
Mr. WILLIAM MATHER, M.P.

Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.
Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Mr. SPENSER WILKINSON called and examined.

4571. (*Chairman.*) How do you describe yourself?—I am a barrister by profession, but I do not practise.

4572. You have devoted some attention to Ordnance maps?—A good deal.

4573. On all the scales?—On the 6-inch and the 1-inch and the smaller scales. I am principally interested in the maps from a military point of view. I was for many years a volunteer officer. I have taken a great deal of interest in the subject of military education and other military subjects. In that way I have had occasion to go pretty closely into some of the questions relating to the Ordnance maps.

4574. Would the 6-inch maps answer your requirements as now produced?—The 6-inch map seems to me not always to give a sufficiently clear representation of the features of the ground. In the 6-inch map as it is produced in Lancashire and Yorkshire and in the northern counties when that scale was first introduced into England, the contour lines were given at vertical intervals of 25 feet, some of these being marked as instrumental contours, either showing where the picket had been driven in or where the instrument had been placed, the others being what we call interpolated contours. In a moderately hilly country the contours at these intervals appear to me to show the features of the ground quite sufficiently.

4575. At 25 feet?—At every 25 feet, but in many of the more recent 6-inch sheets the contours only appear at intervals of 100 feet which fails to give such a view of the shape of the ground as seems to me to be necessary in a topographical map.

4576. I believe that change was recommended by a Committee of the House of Commons?—The reduction of the number of contours was I believe.

4577. You think that was a mistake?—I regret that very much. I should like to illustrate to you, as I think I can in a moment, the weakness of the system, because I also complain that the contour lines were not printed in such a way as to be visible immediately.

4578. Were not or are not?—I say were not, because I have had very little occasion to use the recent 6-inch sheets which are produced in one or two colours by reduction. The 6-inch sheet as now published is a very much smaller sheet than it used to be, and is produced in a different manner. I have not made sufficient use of those sheets to say whether any complaint as to the legibility of the contours there holds good, but as regards the insufficient number I think it applies there also. On this 6-inch map (Cheltenham) I have had to look a long time to find the contour lines at all.

4579. Is that a flat country?—A moderately flat country, not a very hilly country. Looking at this map of Cheltenham you cannot possibly read off the ground at once. You have to look about for it. In order to make out the shape of the ground you require a careful study of the map. I can illustrate that to you. What I am now going to show you is merely to illustrate a point that I want to make. These are old maps that I am going to show you, but I think they will make the point clear almost in a moment. I will ask you to look at this sheet which is one of the 6-inch sheets of Lancashire. This happens to be a country which is almost

Major D.
Johnston.
15 June 1892

Mr. S.
Wilkinson.
16 June 1892.

Mr. S.
Wilkinson.

16 June 1892.

uninhabited in these parts, and therefore there is nothing to mark but the shape of the ground, and in a case like this the contours show immediately. These contours your eye takes in at once because they are not interfered with by other features. The moment these contours are interfered with by other features they become invisible. Here are sheets which are fac-similes of part of the 6-inch map. I will show you the original immediately. That is a bit of North Wales. It is contoured at 100 feet intervals, but the eye does not read off those contours easily, and in order to read the shape of the ground it requires careful poring over the sheet to see the contours marked. Now I have here the same map with the contours brought out; it is the original from which that is photographed, except that on this sheet I have traced the contours out in brown.

4580. (*Chairman.*) You have not added any contours?—Nothing is added but this colour; I have merely traced over the existing contours with brown ink in order to be able to see them, and I suggest that on a map of this sort the contours should always be printed in such a manner that you can immediately see them.

4581. You would suggest that the contoured lines should be printed in colour?—I think so. The same principle applies so far as you are going to use contours on the 1-inch.

4582. I put a 1-inch map into your hands with the contours coloured. Is that satisfactory to you?—As regards the visibility of the contours it is, but this map is not satisfactory to me. I object to the way in which the ground is represented. I will come to that. On this map (a 6-inch map showing the district of Colwyn Bay in North Wales) I should like to point out that these contours are not enough. These are contoured every 100 feet. This is a piece of ground which I know very well, because when I was a volunteer my regiment was encamped here for several years in succession, and this part of the map was photographed for regimental use. That piece of ground we frequently used for manœuvring purposes, and even with the contours coloured this map gives you no such information as is necessary for military purposes of the shape of the ground.

4583. (*Mr. Roby.*) In consequence of the contours being at too great a distance from each other?—Yes; in consequence of the insufficiency of the number of contours and an insufficient amount of detail being given. Supposing you have a contoured plan, the contours do not speak directly to the eye unless there are very many of them and they are very close together, but it requires a certain amount of study and measuring to read from contours what the shape of the ground is; it requires a trained eye to read the ground accurately from the contours, but it is possible by assisting the contours either with tinting or shading to bring out the features of the ground immediately to the eye.

4584. Do you mean by merely colouring the contour line or filling up the interval between one line and another?—By a system of shading. The colouring of the contours is to enable you to see them without being obliged to have recourse to a microscope. You cannot see these contours at all on a dark day. If you take the original map you will not find that it is any clearer.

4585. (*Chairman.*) With regard to filling in the contours, would you contour the map regularly every 25 feet or would you adopt the method which has been recommended by one of the witnesses to us, namely, that it shall be closely contoured when the ground is flat, but where the ground is steep wider intervals be permitted, in fact, that you shall contour by horizontal intervals rather than by vertical intervals. I do not know whether you grasp that?—Perfectly; I should not myself adopt the expression contour by horizontal intervals, but I should say that the vertical interval between the contours should depend on the character and the part of the country that you are mapping. Where you are dealing with a hilly country such as the lake district, a vertical interval will answer all purposes, which conveys very little information when you come to a comparatively flat country such as you get in the Midland counties, and therefore I should make the system elastic, the only proviso being that on each sheet you must say what the vertical interval is that you are using. Even that is not of great importance because a man who can use a map can very soon find what the vertical interval is. In a foreign map which

I can show you, which is not on so large a scale—(no foreign map that I know of is on quite so large a scale as the 6-inch scale; certainly no topographical map)—it is the practice in many of the foreign maps where the normal vertical interval used on the map does not suffice to bring out a particular feature to insert additional contours marked in a different way, which help the eye, but do not disturb the calculation.

4586. (*Mr. Roby.*) Those contours not having been accurately determined probably?—Accurately determined is a very dubious phrase to use about this, because with no system of contours sufficiently numerous to show the features of the ground is it the custom to measure every contour with an instrument. A sufficient number of contours are measured and then the others are sketched in. But the inaccuracy of the sketched contour is probably in most cases so small, that the difference between the true position of the contour, if it had been measured instrumentally and drawn correctly, and any error which the draughtsman or sketched is likely to make, would not be greater than the difference in the alteration of the line by the shrinkage of the paper, so that provided the work is carefully done you do not require what you may call mathematical accuracy.

4587. You do not require instrumental determination for every contour?—Oh, no. I should imagine that the instrumental data already taken to produce the 6-inch map are sufficient, so that very slight additions are wanted. It would no doubt be good to have as many instrumental contours as you can, but I should think that the Survey would not wish to very largely increase the number of instrumental contours even if they were instructed to put on the map a greater number of drawn contours. This is part of a Prussian military map which is on the scale of $2\frac{1}{2}$ inches to the mile, and on which the contours are represented. The different drawing of these lines does not represent a different way of producing contours; it does not tell whether the contours are instrumental or not, but the thick line represents a larger interval. You will see a black contoured line, rather thick, and then thin contour lines, and occasional dotted contour lines. These contours are at 5 metres as the normal interval, and the thickened ones at intervals of 20 metres, while the instrumental contours on the English 6-inch map are at every 100 feet. The meaning of the dotted lines is that they are auxiliary contoured lines.

4588. (*Chairman.*) I imagine that we should get very much puzzled with these contour lines if it were not for the hachuring?—If it were not for the shading, the non-expert would have a difficulty in reading this. A man accustomed to use it gets so accustomed that he reads the forms almost immediately, but this map is shaded. I brought this to show you the assistance given to the eye by a little shading. This shading is running in the direction in which a drop of water would fall.

4589. It seems to me that some kind of assistance such as is here given would very greatly improve the value of the 6-inch map.

4590. The witness who was before us the other day suggested that there should either be a contour every quarter of a mile or at a definite distance vertically?—I do not understand contouring at every quarter of a mile.

4591. This is entirely from a civil engineering point of view?—That puzzles me for this reason. Supposing you are on a perfectly level plain, a mile in each direction. In order to accurately represent that plain you want only a single contour on its boundary because you know that anywhere within that contour that ground is of a certain height. Assuming for a moment that the ground in the centre of a plain is 500 feet high, and your contours are at 25 feet vertical intervals.

4592. He does not have his contours at 25 feet vertical intervals?—I must assume that to explain what I mean. I assume a map with 25 feet vertical intervals and contours, and that you have a piece of level ground which is a mile in either direction. It may be at the bottom of a valley or the top of a hill, but, at the place where that level changes by 25 feet to get on to that plain, there the contour line will be, and that will go round the plain; and you cannot put another contour line on to that without destroying the whole system of contours, because the system is that between one contour and the next there is a rise or fall, and if you put a contour on that plain where there is no rise or fall

you are upsetting the whole system, but you can produce the effect which your civil engineer wants by the very simple plan of laying down the heights in many places. We will suppose you have a plain 500 feet high. You need only scatter about it a number of figures of 500, and then a man sees the height of the plain, and he knows that the same height continues right or left until he comes to a contour line.

4593. The witness was thinking more of the midlands of England where the plains vary slightly?—If you have the contours at 25-feet intervals they will be frequent enough. But his proposal is a proposal which is inconsistent with the use of contours on the present system.

4594. I put to you what the witness said, in order to get at your opinion, as to whether it is a practicable system?—I think not. Supposing I were asked to suggest an instruction to be given to the Ordnance surveyors on this point of contours for the 6-inch map, I should simply instruct them that contours should be used at such intervals as were in their judgment necessary to give a clear representation of the ground, and then I should specify, according to the purpose for which I considered the map was to be used, how much representation of the ground I wanted. For instance, for military purposes, if you have a scale so large as the 6-inch map you want to be able to use that map as a basis for the manoeuvres of troops in action. In that case one of the most important relations between the ground and the troops is whether the troops can find concealment behind slopes or undulations of the ground. Now a difference of 10 feet on otherwise level ground is quite sufficient to hide one body of troops from another. I produce a German military plan in which the contours are at 15 feet intervals, roughly 5 metres. That is what I should call a good vertical interval for military purposes. I myself think it would be very desirable that we should have contours as close as that, but I should not press that. I should be quite contented with contours of 25 feet as the normal interval, but then I should instruct that, in those places where contours of 25-feet interval do not result in showing accurately the features of the ground, other contours should be interpolated, and that where there was a hilly country, where an interval of 100 feet was quite sufficient, then the intervening contours should be dropped.

4595. In fact you would make your contours adjust themselves to the character of the country?—That is so; I would make the vertical interval vary according to the character of the country. As far as I know, that is the practice adopted in regard to contouring in all the military maps used on the Continent, which are on a comparatively large scale. But I do not apply this altogether to a map like the 1-inch.

4596. Before we leave the 6-inch, as you are criticising that from a military point of view, would you say what you think about the existence of the trees as hedgerow timber, and as isolated trees on the map?—I think it is very desirable that the map should go as far into detail as the scale permits without overcrowding; but I should be very sorry to suggest any binding rule upon a point like that.

4597. Is the map overcrowded, do you think, now?—I should say not; I think some of the quite recent sheets are overcrowded. I should like to see a sheet like that (Cheltenham) properly contoured up. I should not say that that was overcrowded.

4598. You would not criticise the map from a civil surveyor's point of view at all?—I should not. As regards the 6-inch map, I am not myself very much interested in those points. My interest in the 6-inch map is mainly as a military map.

4599. From the point of view of the military map it is desirable you think to keep trees in as they are now?—It is all a question how far in showing them you group them, and how far you go into detail. The 6-inch map is reduced from the 25-inch, and on the 25-inch detail can be shown which cannot be shown conveniently on the 6-inch map. The tendency in reducing from a large scale to a small scale is to overload the map with details, and a more desirable thing on the smaller map is to generalise them. Reduction does not generalise; it absolutely reproduces the features on a smaller scale.

4600. In reduction from the 25-inch to the 6-inch, there is a certain quantity of stopping out of detail now, and you think that ought to be carried rather

further?—No; I have no opinion in that direction; I am not dissatisfied about that.

4601. (Mr. Roby.) As I understand you will be rather in favour of the conventional representation of trees on the 6-inch map rather than endeavouring to put particular trees *in situ*?—I should be quite satisfied. That is what I mean by generalising. They are all individual trees, not conventional trees, on the 25-inch.

4602. Some of them are actually determined on the 25-inch?—It can be done on the 6-inch; but I do not think it is worth while.

4603. (Lieut.-Gen. Cooke.) I would like to put to you one question upon contouring. Considering that contouring is a very expensive matter, would you extend the minute system of contouring you have described to all parts of England, irrespective of there being any special necessity?—As far as I know the contours of 100-feet interval are carried all over the country at present, except where you get higher, into very hilly districts.

4604. Not above 1,000 feet?—No; in those very hilly districts I am not particularly anxious to extend the contours above 1,000 feet. As a matter of uniformity I should prefer that the 100-feet contours should be kept up, but I do not think that really important. I should ask you to interpolate additional contours on the basis of those which have already been surveyed in so expensive a manner.

4605. You see the Ordnance Survey can put nothing on their maps which they cannot vouch for, and therefore they cannot put merely loosely examined contours on the map; they must have a certain amount of accuracy, and therefore the contours are expensive, even if interpolated. Take the whole of the centre of England, which is moderately hilly but not very hilly. Would you extend this system you have advocated to the whole of England irrespective of any particular necessity for it?—Well, I think I said I would not have so many contours in very hilly country.

4606. I mean in not a very hilly country—under 1,000 feet?—I should extend it all over the country then.

4607. (Chairman.) It costs, approximately, 1*l.* per lineal mile to run instrumental contours?—I am quite satisfied with the contours on this first sheet that I showed you. Only one contour in four or five is instrumental. Very few are instrumental contours. There are seven interpolated contours to one that is instrumental. Here is a piece of the Lake District on the 6-inch map. I am perfectly satisfied with those contours, because those contours show you at once the shape of the ground; they are numerous enough. Here when we have got above 1,000 feet, there are only 250 feet intervals. I should be very glad to see the 100-feet contours right up to the top of the hill, because then I could walk to the top of the hill with the same certainty as to features that I can on the side.

4608. (Mr. Roby.) But when you get country of that degree of elevation it is not so very important?—No, it does not matter very much; I do not think it is necessary here, but supposing you were to put in the interpolated contours as they are done here, they are not instrumental (Lancashire, Sheet 78, N.E.).

4609. (Lieut.-Gen. Cooke.) Even the execution of interpolated contours involves some expense?—Yes.

In regard to the 1-inch map I propose to confine myself to what I consider the really essential points, and not to trouble the Committee about little matters of detail. I think the two requirements which the 1-inch map does not at present fulfil are that it should be up to date, and that it should be a map representing the ground. The question of the representation of the ground appears to me to be at its maximum of importance in the 1-inch map. The 1-inch map, as it was originally produced, gave as good a representation of the country, speaking of the features of the ground, as it was practicable to do at that time.

4610. (Chairman.) By hill-shading?—By a system of hill-shading to which the only objection that can be made is, that it was not thought necessary to give any explanation to the public of the principle upon which the hill-shading was applied, and that was its inconvenience. If I might digress for five minutes I think I could explain exactly the points that I raise there. When the 1-inch map was first begun there was no such thing as a generally recognised principle upon which the ups and downs of the ground could be represented, but at the time when Colonel Colby took the survey into Wales two principles had been recognised on

Mr. S.
Wilkinson.
16 June 1892.

Mr. S.
Wilkinson.

16 June 1892.

the Continent, one of which was introduced by Colonel Lehmann, an officer in Saxony, and the other by General Dufour, who made the Swiss map. One principle was that you assumed the ground to be illuminated from above, and inasmuch as an inclined surface exposes a less area to vertical rays than a flat surface, the inclined surface would receive less light and therefore appear darker; and Colonel Lehmann's principle was that assuming the light to fall vertically, the darkness or lightness of any surface of map would approximately represent the degree of its slope to the horizontal; the steeper the slope the darker the piece of map; the more nearly flat the surface of the ground the more nearly white would be the surface of the map. That method is of very great use in a not very hilly country, but where you get a really rugged hill country, such as Switzerland, the whole of the ground slopes and is very steep, quite steep enough to be very dark, and your map gets very black, and is very difficult to read. Accordingly General Dufour introduced another system assuming the light not to fall perpendicularly but to fall obliquely from the left-hand top corner; he did not assume in the same way a mathematical relation between the amount of darkness of shade and the degree of steepness of slope, but he rather used his light as an artist uses it to show the features on his model, which in his (General Dufour's case) was the ground. General Colby seems rather to have followed General Dufour's method, and afterwards when the survey extended into the north of England and into Scotland the scale of shading was paid more attention to. The Dufour method has to some extent influenced the English system. Now Dufour's map of Switzerland shaded by his method is the very best that exists, and is one of the most beautiful representations of ground that I know of, and I think the Ordnance Survey sheets of the old survey are perfectly satisfactory in their character. Some of the sheets of that map are as good as anybody requires, and I should be perfectly satisfied if we had that method of representation of the ground for the whole country. But the whole of England south of a line running through Preston from the Ribble to the Humber, nearly the whole of England—I am not speaking of Wales—south of that line is very imperfectly drawn, partly because a great deal of it was published before these methods came into use. The Welsh hills are very well given, and in the north of England the hills are very well given, but in the south of England the hills were very imperfectly given, and when after 1874 or after the completion of the 1-inch map of England the new series was begun, no attempt whatever at representation of the ground was introduced, but what was published and what is still published of the greater part of England is not a topographical map at all, but nothing in the world but a reduction on a small scale of a cadastral plan. With the exception of one or two sheets which have been lately produced, the 1-inch sheets of England represent the country as it would be if it were reduced to a uniform plane above the sea level.

4611. But it is not intended to keep the map in that state?—No I hope it is not.

4612. It is only a question of the time occupied in the engraving of the hills?—The hills can be produced very much more rapidly than by the process of engraving.

4613. That of course is a very important point, I mean as regards the method of production?—I shall have something to submit to you on that point.

4614. We have it in evidence that the production of the hills is very slow indeed, and that the hills are now being engraved in separate plates, so that you can always publish the map as a plain map, as you have already mentioned, or with the hills by two printings.

4615. (Lieut.-Gen. Cooke.) Perhaps you are not aware of the fact, which is rather a curious one, that when the map is published, as it is in many parts (in all Scotland), with hills and without hills, the sale to the public is ten times as great without hills as with hills?—That is, I think, a familiar fact. I attribute that largely to the absence of any explanations being given to the public of the hill-shading, because although it seems very startling, I can remember the time when the meaning of the hill-shading was not understood even among those officers with whom I have had to do. I find that at a great many people when they get the hill-shaded sheet find it very black, and find it very hard to read the name. They do not understand the exact meaning of the hill-shading, and they prefer the clear sheet. I can

illustrate to you in a moment the difficulty that many buyers of maps have. This sheet, which is a great deal used, represents Sca Fell. It is part of the map of Cumberland, and was produced about 1868. I have very frequently used these maps all over the Lake District, and I find that a great many men walking about there do prefer the sheet without the hills, and if you ask them why, they will tell you that the hill-shaded sheet is so black that it cannot be read. "What," they say, "does all this shading mean? We do not know whether we are on the side of the hill or on the top."

4616. (Chairman.) Is not that rather the fault of the man than of the map?—It is, but if the man does not know how is he to find out. If the shading on the map were explained, I think he would very soon begin to use the hill-shaded map.

4617. (Lieut.-Gen. Cooke.) You yourself know the part of the map where the hills are?—Yes, I think this is as good a map as can possibly be. I am not finding fault with the map at all.

4618. (Chairman.) You are finding fault with the instruction of the public?—Yes; if you give me a map as good as that, and up to date, I shall be perfectly satisfied.

4619. Will you look at these engraved maps (Portsmouth and Isle of Wight); would you like the hills in brown in that style or in black in this; there is the same plate in two forms?—The map which has the hills shaded in brown is, in my opinion, very much better. I think it is very desirable indeed that the hills should be given in a colour other than that in which the other features are given.

4620. (Mr. Roby.) Does it to your eye show the character of the ground as clearly as the black?—Yes; I am perfectly satisfied with the brown; I prefer it. This (the brown) is not the most perfect method that can be used, but it is very good; I should be satisfied with it.

4621. (Chairman.) Let me draw your attention to that map (Argyleshire) engraved with hills which is one of the most recent?—That is a map with which I should be perfectly satisfied.

4622. Do you think if that was printed in brown it might be still further improved?—I should like before saying that to see it in brown. If you are going to print in colours there are other methods which will convey the same result very much better. I should like to put before you one or two maps in which the same result is produced by other methods. Of course if you are going into colour then this system of shading is no longer necessary. Here you depend entirely upon the effect of light and shade to show your hill, but if you go into colours you are no longer dependent merely on light and shade, and you can give a great deal more information, because you can also give contour lines.

4623. That is a very mountainous piece; now look at that piece (East Kent) which is not mountainous. That is a district which I daresay you know very well as it is very important for military purposes?—I think very probably if that were in brown it would be quite as good and as useful as if it were printed in black.

4624. Do you think it would be more useful?—Yes. In this slightly undulating country of Kent the method of drawing is not quite the same as in that very hilly part of Scotland. For high hills you can introduce a light from the corner, modifying your vertical light and throwing up the slopes. But for gentle undulations as in Kent you must use only vertical light.

4625. Let me ask you in what form could information be given which the public would take advantage of? Would they buy a sheet descriptive of what is meant by hill-shading?—I think the great mass of the people would not. They would not bother about it at all.

4626. I put into your hand another form of the Ordnance map, a 1-inch photo-zincographed map of the Isle of Wight?—I think this is also a good system. There I see that contours of 100 feet are printed in black. The hills are shaded. Those hachures I think are not printed in black ink. There you print your roads and your streams in different colours and you colour the woods in green. These are all excellent things; but this map seems to me a sort of half-way house; it is, I think, an improvement on the old mere black and white.

4627. (Chairman.) Better than the brown?—I think it is better, because I think it is a very great advantage

Mr. S.
Wilkinson.
16 June 1892.

to print all the watercourses in blue and another advantage to print the roads and the houses in different colours.

4628. You think if it were practicable for other reasons it would be better to produce Ordnance maps printed in colours like that than in the brown form which you think is in itself an improvement on the black form?—I do.

4629. I will now ask you what you yourself think the map should be?—I should like to show you a French topographical map which seems to me to represent a very high standard of production. This is a part of the French staff map of Algeria on the scale of 1/50,000 which is about 1½ inch to the mile, so that it very closely approximates in scale to our 1-inch map. Now, on that map you have a series of contours at 10 metres vertical intervals assisted by a tint of shading, and you have a very great variety of information conveyed—very much of it clearly explained in the margin below.

4630 (*Mr. Roby*.) The effect of the hills there is given entirely by the contours, and the tint of shading, and not by any vertical hachures?—There are no hachures; if you have contours then hachures are not necessary. Any method of shading the map will produce the same effect to the eye, but the hachures are used, where contours are not used, to enable certain mathematical calculations to be made as to the scale of slope. I do not know whether that has been brought before the Committee, but the reason why on the older maps hachures are drawn and tint shading is not used is because in the original maps an accurate mathematical relation subsists between the number of lines in a given space and the degree of slope.

4631. (*Chairman*.) Do you believe with regard to this map that the lines which we are calling contour lines, are really level lines, or are they lines put in to answer the same purpose as hachures, to enable the eye to read the slopes?—I think they give themselves out to be contours of 10 metres interval; but I think the proportion that the sketch-contours bear to the instrumental contours would be very large indeed.

4632. (*Mr. Roby*.) You do not think personally it is a system of horizontal hachures with the exception of a few leading contours?—I think it probably is a system of horizontal hachuring based upon the measurement of the contours, but very carefully executed and done on the spot.

4633. Have you been into this country at all?—No; I have no knowledge of it except from the map. I should like to put before you a map of the suppressed survey of France. It was only issued for a few months.

4634. Was it suppressed for military reasons?—I never was able to get to know.

4635. (*Chairman*.) Do you know anything about the production of these maps from the publication point of view. This is a staff map in the sense of being a staff survey. It is printed on zinc by Mercier and Company, of Paris. Is that a private publication?—I know nothing about the publication of that map.

4636. It is a beautiful map?—I think that is the most beautiful map that at present exists, I think without exception; and I submitted that map to the Committee, because it seems to me that if the 1-inch Ordnance map is to change its method, the very best method ought to be adopted. If the Committee were able to get one or two sheets of the map of France on that scale, I think it would throw a great light on the accuracy of the maps, because you have other French maps with which to compare, and France is a very accurately mapped country.

4637. (*Lieut.-Gen. Cooke*.) I should like to ask one question about the hill-shading; you seem to advocate having the light not perpendicular but slanting from the left?—No; I do not advocate it. I think that the two systems apply differently to different purposes. As far as I know vertical illumination has not often been carried through in any very hilly districts, because the map gets too black, and as far as I know a vertical illumination pure and simple is not used on any of the Ordnance sheets.

4638. Very nearly, I think?—They vary as you will see if you look at the sheets about Cadix Idris and South Wales.

4639. I was talking of the new survey?—I cannot speak of sheets published in the last 15 years; but if you look at the map of Cross Fell in Cumberland I

think you will see that even there there is a certain amount of side light used; but I do not advocate one or the other. If I advocated anything I should advocate vertical illumination. The fact that the Swiss would not use it for their 1/100,000 map has generally been considered to show that, where you have very steep hills to deal with, something else is desirable.

4640. (*Chairman*.) I suppose the difficulty is rather this, that the scale of shading which is quite satisfactory and necessary for districts of moderate elevation becomes extravagant and excessive when applied to a very mountainous region, and therefore to some extent you have to change your scale according to the kind of district in which you are?—It is not a change of scale, but it is a change in the principle of applying it.

4641. (*Lieut.-Gen. Cooke*.) The objection to the light from the side is this: that if your hills happen to have steep slopes on the side towards which your light is coming your artificial light interferes with the natural slope of the ground, and I think we have adopted the perpendicular light in consequence. You must sacrifice truth if you have an angle light?—I entirely agree with what you have said. I put into your hands a handbook which is published in Switzerland principally for military purposes.

4642. (*Chairman*.) Would you recommend that such a book as this should be published?—Yes, except that this is published for military use and is too scientific, but I think some such book adapted to the general public is very desirable.

4643. And you suggest that a somewhat more simple one for ordinary purposes might be published for the Ordnance Survey Department in England?—Yes, that is what I suggest. This is not intended for popular use. Here is a manual issued in Germany to the officers engaged on the survey in order to give them guidance in the drawing of the maps. What I suggest should be issued to the public is an explanation of the principle which is adopted, and that if a scale of shading be used by the Survey it should be issued to the public as part of the book we have just alluded to.

4644. You would not put that on the sheet of characteristics?—Yes; it would be excellent to have the scale of shade on the sheet of characteristics if such a scale is used. Whatever method of representing ground is used on the map should be fully explained either in the handbook or sheet of characteristics.

4645. Should be obtainable in fact?—Should be obtainable by the public.

4646. Do you criticise the 1-inch map from any other point of view?—As regards the rate of production.

4647. If you could suggest how you could hasten the publication of the hill engraving that would be very valuable. As regards the other I think we have sufficient evidence?—Then it is not necessary for me to go into the rate of production; that seems to me to be a very great grievance.

4648. You might tell us how you think the production of the hill-shading on the English maps might be hastened?—Assuming for the moment that the 1-inch map will be continued to be produced with hills shaded by vertical hachures as in the maps you have of Argyllshire and East Kent, then I suggest that instead of employing an engraver to draw those hachures on a copper plate the map should be drawn by a draughtsman, and that from that drawing a copper-plate should be produced by sun-engraving or heliogravure, and I submit that that process is five times as rapid and one quarter of the cost of engraving direct on to a copper-plate. I should like to put before you some very important facts about that. That method has been used in producing the new staff map of Austria. I have not produced the staff map of Austria to you to illustrate what I consider desirable in the representation of the ground, because for Austrian purposes the method which I should prefer has not been altogether used; but I will show you the sheets of that to show that the process which will produce that map will produce substantially the kind of shading that is used on our map. (*Sheets of the Austrian map were here produced*.) It is not a particularly beautiful map, and these are all old sheets.

4649. I will just read to you Sir Charles Wilson's evidence upon this point:—"There is the process of 'heliogravure. I went very thoroughly into that question, and an officer of the Survey visited several of the foreign establishments. I found that in Austria, where the process is largely used—and the

map. So long as they are distinct, so long as the foot-path can be clearly distinguished from another mark, you do not as a rule have too many of them.

4660. Would you criticise generally the 1-inch map as to whether it is satisfactory in its drawing or not, or as to whether it is defective in any particular from your point of view, putting the question of hills aside?—I think in the recent maps there has been a tendency to make the drawing and engraving more coarse than it used to be. I have here this new sheet of the 1-inch map of the neighbourhood of Yarmouth, and I have brought with it the portions of the old map, which correspond, and I think a little examination will show the difference. The new map, I suppose, represents the country as it now is—the old map of the country as it was many years ago. The old map dates from 1838, and the new map is dated 1892, and has just been published. If you follow those hills and compare them with these they are substantially the same, but in my opinion in the older map they are more delicately drawn, and if you had them in brown you would have a better impression than you have with the new map in brown.

4661. (*Lieut.-Gen. Cooke.*) The new map is a temporary map for use until the engraving is finished; it cannot be criticised as a permanent map?—I can only speak of that (Great Yarmouth) as one of the public, because this is a map I applied for and bought. I do not see that you have made any advance between 1838 and 1890.

4662. (*Chairman.*) Have you any other remarks to make about the 1-inch map, always understanding that it is unnecessary for you to say anything about the rate of production, because the Committee is satisfied on that point?—No, I think I have brought out the main points to which I wish to draw the Committee's attention.

4663. (*Mr. Roby.*) I should like to ask you whether in regard to military manœuvres or anything of that kind in which you have taken part you have found the 1-inch map large enough?—I should very much prefer for military purposes a somewhat larger scale.

4664. Not so large as the 6-inch?—The 6-inch I consider unnecessary for military purposes. The scale usually adopted for the military map on the Continent is 1/25,000, 2½ inches to the mile, which is the scale on which nearly all the Powers publish their maps for military use.

4665. (*Chairman.*) For military purposes is it not a considerable advantage to have a considerable area in your map?—There is a balance of advantages. The map which you issue very widely among your troops must have a considerable area, because each man cannot carry more than a limited number of sheets, but the map which you use for the direction and conduct of manœuvres it is desirable to have on a larger scale than that.

4666. You mean distinguishing strategy from tactics?—No; the strategical map comes under a different head.

4667. You want, in fact more detail than you have on the 1-inch map to conduct troops satisfactorily?—It is desirable to have it.

4668. Your objection is that on the 1-inch map you cannot see so clearly where you are going. Supposing the 1-inch map is enlarged to 2 inches, does that answer the purpose, as long as it has the same detail on?—So long as it only has the same detail on I do not care about it being enlarged. If it is enlarged I should like to have more detail. I should say for ordinary purposes the 1-inch map would be sufficient provided the map were produced in a better way as regards the representation of the ground.

4669. (*Mr. Roby.*) Can you put before us two or three specimens of foreign maps?—I should like to submit to

you one or two specimens of foreign maps on a smaller scale, because the publications of the Ordnance Survey include a map of 4 miles to the inch, and a scale of 10 miles to the inch, both of which are given as perfectly plain sheets. This is a map of Sardinia on pretty much the scale of 4 miles to an inch, the scale being 1/250,000, or about ¼ inch to a mile. I produce this to illustrate the way in which the features of ground could be shown on the 4 miles to an inch map of England, always assuming that the process as at present used of hachure drawing is adopted. I do not like the oblique illumination if you can do without it, but if this were done with vertical illumination it would be so black you could not read it. I produce a French map on nearly the same scale 1/200,000, that is about 3 miles to the inch. It is contoured and is a hilly sheet, and I have a piece of the same map showing a comparatively flat country. This is a strategical map, a staff map published I suppose mainly for strategical purposes. The green colour indicates woods, the hills are represented in a sort of grey tint, and the waters are in blue.

4670. (*Mr. Brickdale.*) Are these all Government publications?—Yes, they practically all are. I will show you one presently which is not. I go now to the smaller scale, the map of 10 miles to 1 inch. This is a map of France published by the *Dépôt de Fortifications* on the scale of 1/500,000. This is extended right along the south coast of England; that is a very beautiful travelling map indeed.

4671. (*Chairman.*) We have seen that. That is the one that shows us England up to London. Have we any maps as good as this produced privately?—No, not in England. I have a map published by Perthes, of Gotha, on the same scale as the French map. This map is published in two editions—one for military use, one for ordinary use. That for military use is distinguished from the other by the political boundaries not being marked and the woods being shown with a green tint. All wooded ground is tinted green on this.

4672. Should you like to lead troops with the help of that map?—I do not know that it is meant for the purpose of actually leading troops. I think it is meant for the strategic conduct of troops.

4673. (*Lieut.-Gen. Cooke.*) It is a very good strategic map, I think. The hills you see as a mass, and the valleys as separate holes through them.—Yes.

4674. That is just what you want for a strategical map. If you see a great obstacle like a range of hills you want to see where you can get through?—That is what this map is really made for, and for general use of course. That has been published for the whole of Germany, and it is very cheap.

4675. As a private enterprise?—Yes.

4676. What is the price?—You get two of these sheets for 3s. I have one more map of that sort published by the Austrian Government for the whole of Central Europe. It is not, in my opinion, one of the best, but it illustrates what has been done abroad. The scale is 1/750,000, and it is from the mouth of the Rhone to Turin.

4677. (*Chairman.*) Is that an old map?—No, a comparatively recent map. I should say that this was published six or seven years ago, no longer than that, because it was based on the reduction of the heliograph map of Austria, which is itself comparatively new. The Austrians publish three maps, the black-and-white one which you have seen, which is produced by heliogravure; then they produce a strategical map, of which here is a piece, on a scale of 1/300,000. This is a map which is not very much to be commended, because it is rather crowded with detail and the ground is not well brought out. And the printing is not good. They further reduce from this map of 1/300,000 to 1/750,000, and there they are rather more successful.

The witness withdrew.

Mr. GEORGE LEWIS, M.I.C.E., F.G.S., Mining Engineer, Derby, Past President of the Midland Counties Institution of Engineers, called and examined.

4678. (*Chairman.*) You are a mining engineer?—Yes, a mining engineer.

4679. You have come to give us information with regard to large-scale maps and their relation to mining engineering?—I would confine my attention more particularly to the maps which mining engineers are using

at the present time and also to another map which we should be very glad if the committee could see their way to publishing for us.

4680. What maps do you use now?—We use the 1-inch maps, but they are not of very much service to us except to give us a general idea and bird's-eye view of the country.

Mr. S. Wilkinson.
16 June 1892.

Mr. G. Lewis,
M.I.C.E.,
F.G.S.

Mr. G. Lewis,
M.I.C.E.,
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4681. Have you been able to get the new 1-inch maps?—No, we have not got them.

4682. You are using the old ones?—We are using the old ones.

4683. (*Lieut.-Gen. Cooke.*) What part of the country are you in?—My practice is confined chiefly to the counties of Derby, Nottingham, South Yorkshire, Leicester, North and South Staffordshire, Worcestershire and Northamptonshire.

4684. (*Chairman.*) And you use the 1-inch maps simply to show the country in which you are working?—Simply to get a general view of the country. We use the 1-inch maps more particularly when they are geologically coloured. We find those of very great service to us.

4685. Those are the old maps?—Those are the old maps. We find the information upon them exceedingly useful and wonderfully correct considering the difficulties the Survey must have had in getting at the information.

4686. The geological map is very good?—Very good indeed.

4687. Then you use the 6-inch map?—Yes, the 6-inch map we use more for estate purposes and also we use them for showing the estates upon leases of mines.

4688. For conveyancing purposes?—We find they are exceedingly useful for that.

4689. Do you prefer them to the 25-inch?—We prefer them to the 25-inch because in very many instances the 25-inch is too large. For instance, supposing you have an estate of 3,000 or 4,000 acres, which is not at all unusual, the plan itself is too large and cumbersome to show upon a lease, more so in fact than is necessary. In recent cases I have invariably used the 6-inch scale, and the solicitors with whom I have come in contact say that is quite sufficient and is a very useful map for the purpose.

4690. Do you use the 25-inch map at all?—Very little for this purpose. We do use it but not for the purpose of conveyancing unless it is an odd field of a few acres or a small estate that is being leased.

4691. As a mining engineer, the 25-inch map is of no use to you?—Very little indeed. Of course, by the Mines Inspection Act of 1887, which was the last one passed, we were allowed to make the surveys and to show the workings of the mine upon the 25-inch map. We were exceedingly anxious at that time that the Government map might be used for the purpose, or that the Government map should be accepted as sufficiently large, and we asked permission that the 25-inch scale might be used.

4692. Is that by statute?—By statute; but we find in practice that it is not large enough for our purpose, and I have prepared you the actual workings of a colliery on the 25-inch for your information.

4693. Will you produce that map?—This plan represents the actual workings of the mine. These represent the roadways underground. These lines show how the workings progress each half year. You must understand that the object of making plans of these workings is not only to show where the workings themselves are, but we have each half year to make calculations of the areas worked during the preceding half year, and these plans show the workings from half year to half year. I have had the lines put in so that you may see exactly the purposes for which they are required.

4694. These cross lines represent your advance?—Yes, which varies according to circumstances.

4695. These do not represent roads or anything down below, but merely the extent to which you have worked?—The lines that way (across) represent the face of the coal at certain dates.

4696. (*Lieut.-Gen. Cooke.*) You dig out between the roads?—This plan shows the coal as it is being worked on the long wall principle; we take out the whole of the coal before us, and the roads are simply maintained by packing the *débris* upon each side upon which the weight of the earth settles down, the roads being kept open.

4697. (*Chairman.*) Are there many seams here one below the other, or is this only one seam?—In this particular colliery we are working another seam about 14 yards above.

4698. That is shown on a separate map?—We show that on a separate map.

4699. (*Mr. Roby.*) That is really all on one level?—Yes. This is the level of the mine—this is the plan upon which the workings are shown.

4700. (*Chairman.*) And you have another map to show any other plane upon which you are working?—Well, any other plane or any other seam; it comes to the same thing.

4701. Is this map of insufficient scale to enable you to show where you have got to?—We find in practice, extending over a considerable number of years, that the generally accepted scale is 2 chains. This is too small for our purposes. The whole of these roads are surveyed underground by the theodolite or compass and then plotted; the measurements are afterwards taken off, and other matters of detail required where care must be exercised. For these purposes we have found the 25-inch scale too small.

4702. Have you a map here showing what you did before you were tied by statute to this map?—You must understand, sir, we are not tied by statute to this map. This is the smallest scale upon which we are allowed to show the workings. This is another plan of the same mine. It is our own survey on the scale of 2 chains to an inch—the same seam of coal drawn upon the scale that we find most convenient, that is about 40 inches to the mile.

4703. And you ask for colliery purposes that such a map should be published by the Ordnance Department?—Yes, these maps are exceedingly expensive. We re-survey the estate, and we feel under the circumstances that Government having already surveyed it, it might be simply a question of plotting. It is very desirable that these plans should be plotted on the scale of 2 chains to 1 inch.

4704. (*Lieut.-Gen. Cooke.*) Have you ever asked to have it done?—No.

4705. (*Chairman.*) Can you tell me what that survey has cost you, or what they do cost you per acre?—These surveys cost us about 1s. 6d. or 2s. per acre. It depends upon the amount of detail upon the estates themselves, as to whether or not there are houses upon them. This estate is about 3,000 acres, and the whole of it is leased by one firm, so that this plan would cost something like 225*l.* alone.

4706. (*Mr. Roby.*) Is the whole thing in this map?—Not the whole extent; it would have made such a large plan that it was omitted. This is simply a part of the estate upon which I show actual workings.

4707. Whereas three or four half-crown sheets of Ordnance would cover it?—Exactly; a little more than that. It depends upon where the joinings are.

4708. (*Chairman.*) We will say the same area might be represented on the Ordnance map sheets for about a pound?—Yes. I was going to say that we require as little detail as possible upon these plans. We should prefer them without detail.

4709. Would the survey which you would require be a very small one showing very little detail upon the surface?—Yes, that is so, and uncoloured.

4710. And you wish to ask that the Ordnance Survey should supply you with an enlarged map of the 25-inch?—Yes, we only ask that it should be enlarged to a scale of not less than 2 chains to the inch.

4711. (*Mr. Roby.*) Would enlarging the 25-inch by photography answer your purpose?—Yes, assuming that it would be a correct plan.

4712. (*Chairman.*) Unless the errors were too largely magnified, it would answer your purpose?—It would.

4713. (*Mr. Roby.*) The detail would be sufficient?—The detail would be more than we should require. We do not want much surface detail for our purposes. You see that having to show the whole of these workings the less surface detail we have the better. We do not require any trees to be shown. We require them uncoloured, and as far as the buildings are concerned we simply hatch them.

4714. (*Chairman.*) You only require that for the colliery districts?—Only for the colliery districts.

4715. And all colliery districts would be likely to make the same demand as you make for the special districts?—Yes, the rule applies generally that the plans are drawn to a scale of 2 chains to 1 inch.

4716. Have you any experience in metal mines?—No, my work does not extend to those with the exception of gypsum mines.

4717. Not to mines running in lodes?—No.

4718. Is gypsum in beds?—Yes, not in lodes.

4719. You cannot speak from experience as to whether the metalliferous mines such as tin and copper would want the same advantage as yourselves?—No; I should prefer not to make suggestions with reference to that.

4720. (*Lieut.-Gen. Cooke.*) Supposing in order to get the accuracy that you want it was necessary to replot from the field books, would you be prepared to bear the expenses. Of course the whole expense of the survey would be saved; it would be merely replotting from the field books and re-drawing the plan?—Of course, that depends upon what the expense might be. I have no knowledge of that.

4721. (*Mr. Roby.*) It would be very much less than what it would cost you to do it yourselves?—That I cannot tell.

4722. (*Chairman.*) Have you ever tried enlarging a 25-inch for your purposes by photography?—No. We have not the means of doing that.

4723. So that you cannot tell whether the magnified errors would be serious?—I do not quite think that would be the case. Supposing there was an error in the original plan which measured an inch and you enlarged that plan, I think the error would still remain in the same proportion.

4724. (*Mr. Roby.*) It would be four times as big an error as before?—No; I think it would still remain an inch or chain as the case might be. Of course it would represent more space on the larger scale. My own impression is that the error would remain the same. If it was a chain in one instance it would still be a chain in the larger survey.

4725. (*Chairman.*) Would it not be worth your while to apply to Southampton for a photographic enlargement of the scale which you require and then see whether it answered your purpose?—Yes, we might do that, but this is a question which affects every colliery district in England. We are all precisely in the same boats as regards these plans.

4726. But if a photographic enlargement would answer the purpose it could be produced without any material cost. If that would apply to one colliery it would apply to all?—It would apply to all.

4727. The only question is whether the accuracy of the 25-inch map is so great that it would bear enlargement to four times the size for the particular purpose for which you wanted it which does not require immense accuracy?—Of course it is very important that these mining plans should be quite correct otherwise we might be led into difficulties by working other people's coal and get into all sorts of trouble in various ways.

4728. (*Lieut.-Gen. Cooke.*) How do you connect your underground survey with the top survey?—Only by means of the shafts. We can very often follow from the subsidence of the surface.

4729. (*Chairman.*) In testing by shafts have you often found any appreciable errors in the 25-inch survey?—No, not of any great importance.

4730. Have you found any error so considerable that if magnified four times it would render the plan of no service?—That has not been my experience, but I think one of the difficulties presented by the 25-inch maps is that the sheets occasionally do not fit for some reason or another. I do not know why that should be. I mean that the fences do not meet when the sheets are placed opposite each other.

4731. In your profession I suppose you are acquainted with the difficulty which arises from the shrinkage of paper?—Yes.

4732. Do you suppose it is due to any other cause than that?—Yes. It occurred to me to say that the sheets were so small that the error was larger than it ought to be from that cause, but it may arise in the first instance from inferior paper.

4733. (*Lieut.-Gen. Cooke.*) You are aware you can always get tracings from the original manuscript plan on application, and in these there would be no errors of expansion?—I was not aware of that.

4734. (*Chairman.*) Is the paper satisfactory on which the maps are printed?—We should ask that you give us a little better paper, like this 2-chain plan which I have prepared.

4735. You want thick, drawing paper?—Yes, for the simple reason that there is such an amount of work to be plotted on these maps that we wear them out in a very few years. I should like very much, sir, to see some general means adopted by which your survey might be generally used amongst mining engineers.

4736. If we supply you with a magnified copy of the 25-inch map, magnified to your scale will you test it and see if it is satisfactory?—I shall be very pleased to do so. Those are the actual workings, and this was the actual survey, and if you supplied me with a plan I should prefer its being the surface at this particular colliery.

4737. Would one sheet of the 25-inch, dealt with in that way, answer your purpose sufficiently for testing?—I am afraid not. I found in this case that when I came to get the sheets it took four to represent this portion. The joint somehow or another is always in the wrong place.

4738. Have you any other points you wish to raise?—I can only say, sir, I shall be very pleased indeed to test anything of that sort. This is a 6-inch Ordnance, which is occasionally used.

4739. What is the particular estate?—This is the same colliery. I have had the same colliery marked in this case; it is near Nottingham. You see we use the 6-inch for estate purposes, and we also use it to get a birdseye view of the underground workings. If you notice these lines, they represent the roads underground; the pink lines represent the intake airways, and all the blue lines the returns. Now when the inspector of mines visits us, which he periodically does, if he wants any information as to the general course of ventilation we make use of this plan to show him.

4740. And this plan is satisfactory for the purpose?—It is large enough for that purpose. Two lines represent a road on the larger scale. In this case only one.

4741. For the minor purpose then of showing matters in connexion with the colliery the 6-inch map is an adequate scale?—Yes.

4742. But for detail purposes the 25-inch map is not sufficiently large?—No, that is the case. We require a map of at least 40 inches to the mile. This (the 6-inch) is a very valuable map. I should be exceedingly sorry to see it go out. It is used very extensively, and is an exceedingly useful map to us.

4743. With regard to revision, I suppose you want it kept pretty much up to date?—Of course the value of it is very much enhanced by being filled up to date, but we do not find that is a difficulty which would present itself so much to us seeing that we have a staff in our offices capable of filling it up with any little detail that may be wanting.

4744. (*Mr. Roby.*) You are dealing with what is underground, rather than what is on the surface?—Both surface and underground.

4745. (*Chairman.*) The colliery districts were the first surveyed?—I am not quite clear about that.

4746. So that they are the most obsolete?—Yes, we have found very serious omissions from the 25-inch plan. By omissions, I mean that they have not been kept up to date.

4747. Do you think if the revision was done once in 15 years it would be adequate?—I think that is rather too long. I think myself that the revision ought not to occupy more than 10 years.

4748. With regard to the execution of the 6-inch maps, do you find any objection owing to the introduction of zincograph maps instead of printing from the engraved plate?—None whatever.

4749. They are good enough?—Quite good enough. If you can get a map of that size for one shilling, I do not think there is much to complain of. They are quite good enough for our purpose, because as you see we mount them on linen.

4750. (*Mr. Brickdale.*) You spoke of maps on leases. The description of the mine in mining leases is often very vague, so far as my experiences goes?—The description of the mine itself; but not the surface leased.

4751. Could you by using the Ordnance map for the surface with the addition of sections, or verbal descriptions, make an exact description of the mines and minerals included in the lease?—Oh, yes; I think so. I suppose it would be out of place to speak of the geological survey.

4752. I do not think that is referred to us at all.

The witness withdrew.

Mr. G. Lewis.
M.I.C.E.,
F.G.S.

16 June 1882

Mr. D. W.
Freshfield.

16 June 1892.

Mr. DOUGLAS W. FRESHFIELD, one of the Hon. Secretaries of the Royal Geographical Society, called and examined.

4753. (*Chairman.*) You have had great experience of maps?—I have been for the last 11 years one of the honorary secretaries of the Royal Geographical Society, and I have also during the last 30 years had to deal with a good many of the European surveys, for example the old and new French, Italian, Swiss, Austrian, and Russian maps. As a traveller I have walked much in rough countries, guiding myself by the national survey maps, and have studied them from that point of view.

4754. What is your opinion of our Ordnance Survey?—Perhaps it would be convenient if I handed in a copy of the resolutions of the Council of the Royal Geographical Society, which were presented to the Board of Agriculture last year.

4754A. We will have those upon our notes?

RESOLUTIONS OF COUNCIL forwarded to the PRESIDENT of the BOARD OF AGRICULTURE, June 10th, 1891.

I. The maps issued by the Ordnance Survey Department are necessarily more authoritative and generally more correct than those which owe their origin to private enterprise.

II. It is accordingly much to be desired in the public interest that the Department should be provided with funds sufficient to enable it rapidly to complete the issue of the maps now in progress, and especially of the maps of Great Britain on the 1-inch scale.

III. It is not less important to keep the sheets already issued corrected up to date, in which respect the English Survey is far behind those of several of the great countries of Europe.

IV. It is further desirable that the maps should be brought more directly under public notice, and made more readily purchasable. With this object it is suggested that the Ordnance sheets on the 1-inch scale of every parish should be hung in one or more of the parochial post offices, and that the provincial agencies should be encouraged to sell those maps on ordinary trade terms.

V. That in regard to any new maps to be issued experiments might advantageously be made in colour printing, which has been used very effectively in the "Carte Militaire de la Frontière des Alpes" and in other maps recently issued by the French Government Departments.

VI. That these maps should be supplied to the public conveniently folded, and on thin but tough paper, as well as on that now used.

There is another point, omitted in this memorial as not geographical, which I should mention; the fact that the Government maps are not accepted as legal evidence of boundaries. This has been adverted to in a memorial presented by the British Association.

With regard to your question (*Question No. 2*), sir, I should like fully to associate myself with what Sir Charles Wilson said in Edinburgh in an address which is printed in the proceedings of the Royal Scottish Geographical Society, that in criticising the English Ordnance surveys we should always remember that they have been very much hampered as compared with foreign surveys, by the number of what may fairly be called plans which they have been expected to provide for public use, but mainly for private purposes. Our survey system as a whole bears the impress of having been planned, not as an expert committee of men of general scientific interests would direct, but so as to please a parliament of town and country land and property owners. Physical features are too much neglected or subordinated to more "practical" objects. In the old survey, the only one of much of the West of England in existence until quite lately, Exmoor, its streams and roads, were wildly misrepresented. In the new maps contour lines are not shown at all, or are shown at a different interval (250 feet) above 1,000 feet, and no depths are given to the lake basins. Abroad, as a rule, less attention is paid to private needs; they are kept in the second place; everyone has a general map up to date of his district within his reach. A man who wants a property plan has to go and purchase it; the office provides such plans in manuscript, but it is a separate business, and the foreign surveyors as a rule concentrate their efforts on the production of maps on scales not exceeding 1/25,000.

4755. By plans you mean the 6-inch, the 25-inch, and the town maps?—Everything larger than the 6-inch survey; the 6-inch would come between the two classes of maps and plans. I think the two great and immediate requirements with respect to our Ordnance maps are the rapid completion of the new 1-inch, and a regular system which would ensure it being kept up to date, and not hanging, as it does now, far behind

date; and I think we may consider that these are fair and reasonable demands when we compare what is done in Italy, in Austria, or in France, with what is done in our own country. The whole of the published sheets of the *Carte Viciinale* of France, I believe, have been brought out since 1879; Italy has been re-surveyed you may say roughly since 1860, since it became united Italy. I am not sure that the survey began so soon, it may have been later, but that would be the earliest, and if you look to the key-map of the Italian survey (which I have here), you will see to what a very large extent the map has been published, and that in two forms. There is first the survey, on the scales of 1/25,000 and 1/50,000, which is published in advance, lithographed, and then there is the engraved map on the scale of 1/100,000 which follows; both of these have been very well pushed on. Austria-Hungary has been entirely re-surveyed—there are about three sheets remaining to be published—since 1870, and that despite the addition of Bosnia. In France since 1870 two departments of the Government have been indefatigable in map construction.

4756. That contrasts very favourably with what we have done?—I think that contrasts very favourably with what we have done.

4757. With regard to the excellence of those maps, are they as good as ours, take the Italian one first of all?—I think there is one distinction to which attention should be drawn; the smaller Italian map, the finished map, has contour lines as well as hill-shading, in which of course it differs from, and is so far superior to ours. I should like to say something later on as to what my idea of a perfect map is. I think with regard to the earlier form of publication, the lithographed or zincographed maps (1/25,000 and 1/50,000) are very superior to ours. I do not know that in technical merits of execution, with the exception that it shows contour lines, this engraved sheet (Rome and environs, 1/100,000) can be said to be superior to our engraved maps. I exhibit also specimens of the Italian mountain mapping (Gran Paradiso).

4758. Is this from a plate?—This (1/100,000) is from a copper-plate. That (1/50,000) is the earlier map, the zincograph map.

4759. Which is the finished one?—The copper-plate. I do not put forward these maps at all with the object of contrasting them technically with the English, but simply as regards the speed with which the surveys have been executed. For perfection of workmanship I should not look to Italy, I should look rather to France, and particularly to Switzerland.

4760. Can you say from your own knowledge if this contoured map (Gran Paradiso) is accurate?—As far as I have tested it it is. There are some failings to be found on the high Alps in the Italian surveys, but on the whole it appears to be a very good survey.

4761. You think the rivers have been all surveyed up to their sources as shown here?—Most assuredly, but as I say, I am not now making relative excellence my point of comparison. It is possibly not as good as the English.

4762. (*Mr. Roby.*) You are comparing them in speed of publication?—Yes.

4763. Do you think it would be more satisfactory if the English maps were published less perfectly, but, more rapidly?—Certainly not. I think it is very much to be regretted that they should, in some instances, have been published with contour lines only up to 1,000 feet, and a blank beyond; in other (*e.g.* Scotland), with contour lines at unequal distances at different altitudes.

4764. Generally the perfection with which the work is done has a good deal to do with the slowness of the process?—No; I think it is the parsimony of the Treasury which has most to do with its slowness. I think if the Survey had money enough we could work as quickly as any other nation.

4765. As quickly as any other nation, and relatively to what we now produce more imperfectly?—I do not think you have any right to say the French work is less perfect than ours. The Swiss map is more perfect, but then the Swiss staff have nothing to do but to make maps; the military staff have no battles to fight, and can devote themselves to this work. I bring the next map forward for the purpose of showing what can be done by a quick lithographic process. This is the cheap issue, on the scale of 1/50,000, of the French military map of France. You have two departments as it were

running in rivalry. The Home Department publish the *Carte Vicinale*, and the War Office publish their maps, which they are very careful to advertise. The other day I bought General Marbot's Memoirs, and this little advertisement dropped out of it, which shows the way they push the advertising of their maps.

4766. (*Chairman.*) Is that a Government advertisement?—Apparently it is a Government advertisement. I think the Corsican sheets better than the new 1-inch map of Snowdon which has just come out.

4767. The old 1-inch map of Snowdon was remarkably good?—It was remarkably good for an English map; it had that picturesqueness which the old maps of the survey had—the general relief was very well done; it was an artistic map. But if you ask me if I should care to walk in a thick fog over mountains by it, I should say that the hachures were much too conventional. The difference between that and one of Dufour's Swiss maps would be that in the latter you would know that every little mark had reference to something on the spot, you would feel that the man who had cut that mark had actually walked over, or knew, the ground, whereas in the English map, or Scotch, there would be a certain amount of conventionality, an obliteration of minor features with the practical result that it would be easier to find your way with the Swiss map than with the English map.

4768. Supposing you were walking over Snowdon and you had choice of the old map and this new one, which is the one which you would take?—I have hardly looked at the new one sufficiently. If it were contoured above 1,000 feet I should take the new one, but as they are I should take the old one.

4769. (*Mr. Roby.*) When you say it is inferior you mean it has not got the hills on it?—I think it a feeble production; the outline is blurred and it is not cleanly printed.

4770. (*Chairman.*) This is the advanced edition of the photo-zincographed map. (*Lieut.-Gen. Cooke.*) It should be explained that this is a temporary map which is issued until the engraved map is completed?—Quite so. I only quoted that because I was asked whether it was desirable to hurry on incomplete maps rather than wait for better ones, and I say that on the whole I would rather wait for better ones.

4771. You understand this is not the engraved 1-inch map?—Quite so; I should not have quoted it if the question had not been put in that way.

4772. (*Chairman.*) Will you continue your statement?—I should like to say as the subject next in importance to the rapid completion of the 1-inch map on the present system and its constant correction, that I think experiments ought to be made, as suggested in the memorial of the Council of the Royal Geographical Society, with a view to the adoption of a method of colour printing which should exhibit both contours and hill features. My impression is that the scientific map of the future must have both contour lines for military and scientific purposes and for scientific minds, and hill features for ordinary use; and must be printed in colours so as to exhibit without confusion natural features, artificial boundaries, human constructions, and place names. This point was discussed a good deal at the exhibition of Swiss maps held at Zurich. The new Siegfried Atlas, which as you know is contoured, was exhibited and it was found that the peasant visitors did not appreciate it. Consequently they set to work at the Topographical Bureau to prepare several specimen maps trying different plans for combining with contour lines methods of showing relief by tints graduated according to the slope.

4773. (*Lieut.-Gen. Cooke.*) You have not got those experiments have you?—Yes; I should say this system is not limited to Switzerland, the French War Office has been doing the same thing. It has been replacing its old maps by maps printed in colours, varying from five to seven in number. That is a sheet of the Swiss Siegfried Atlas with only contour lines. The scale is 1/50,000. That is Interlaken and the north part of the Bernese Oberland. This survey was issued on the half-scale by General Dufour about a quarter of a century ago; now they are terminating the publication of it on the original scales. It was this map being contoured which was unintelligible to the uneducated public. I think it is the most beautiful map in the world; for walking or any purpose it is almost the most perfect physical survey you can have. To try and make it popular the Federal Staff have issued the map on the same scale with hill-shading combined with contour lines.

(I exhibit specimens.) This specimen has one obvious objection, that the light is thrown from one side instead of being vertical, and in consequence you have an unscientific darkening of one slope which makes it look steeper. I think they have tried other experiments with a vertical light. Here are maps of the Upper Engadine, Zermatt, and the Oberland. A number of experiments have been tried in maps of this description.

4774. (*Mr. Roby.*) That colour is put on with the brush?—It is colour printing in the brush style.

4775. (*Lieut.-Gen. Cooke.*) Light from one side is fatal. You do not like a side light, I suppose?—I do not like the side-light. But there is no doubt to the ordinary eye such a map gives a very graphic picture of the country. At the same time, if you want to move troops or if you want to know exactly where your contour line is so as to get the level, you can do it perfectly. Next I should like to call attention to the French maps. You probably know this (catalogue), which was published by the French War Office at the time of the Paris Exhibition in 1889. It gives a series of specimens of French maps with remarks and the date of the survey upon them, and you will see from it the kind of system which is recommended for a new map of France. The Bureau is issuing a map of Algeria on the same system in seven colours, and has projected several maps of France on different scales in five or six colours.

4776. (*Chairman.*) That is similar to the one we have just seen, I suppose?—I do not commit myself to any of these systems as perfect, but I think that contours combined with shading is the direction in which the scientific map of the future will be found. That is a sheet of the Algerian map.

4777. Do you like that map?—Yes, but I can imagine better. It tells me the story of the country very well from a physical point of view. There is another specimen of the Algerian map which gives the town of Algiers. I should call attention to one point in it, the sea-depths are given, which I do not think is often the case. The French have also been trying experiments in colour printing on a smaller scale.

4778. (*Lieut.-Gen. Cooke.*) That is printed in red and blue, is it?—The map you hold is a smaller map on the scale of 1/500,000, printed in five colours, and is, I think, a failure.

4779. Almost all foreign nations have given up the vertical hachuring, have they not?—Italy has not. In the Italian map I showed you just now the vertical hachuring is still retained, and it is also in the Austrian maps.

4780. Do you mean between horizontal contours?—Yes. That is a sheet of the Algerian map. That shows you the capital with the sea-coast.

4781. Is that hachured?—That is simply coloured. The depth of the colour corresponds to the steepness of the slope. Here is the Austrian map in which you see there is both hachuring and contouring; all the foreign nations endeavour to combine contouring and hill relief either by hachuring or shading.

4782. They hachure between the contours, in fact?—In some maps. In others by lithographic processes they tint to a depth corresponding with the steepness of the slope to represent the relief in the surface of the country.

4783. (*Chairman.*) Will you criticise our experiments?—There is the English engraved map (Portsmouth and the Isle of Wight) printed in black, and there it is printed in brown from the same plate?—Well, to my eye, the printing in brown is a great improvement for a map which is not a contoured map. That seems to me a very nice map, and I prefer it to the other.

4784. Will you look at the map on the wall (Argyishire), which is a mountainous district; it is printed in black. Do you think that would be better if printed in brown?—I think it would. The hachuring is effective but I cannot judge as to its local accuracy in detail. The new Scotch maps have been severely handled by competent critics in the "Alpine Journal," with regard to the Cuckullins in Skye. I think with regard to the contoured maps it is a great pity that the scale of contouring is not uniform. I believe that at 1,000 feet it stops or varies. It would be much better if the ground were contoured all through up to any height, as in Switzerland.

Mr. D. W. Freshfield.

16 June 1892.

Mr. D. W.
Freshfield

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4785. (*Lieut.-Gen. Cooke.*) There are no contours above 1,000 feet now?—From my point of view, both as a geographer and a mountaineer, I regard that as barbarous. I am very fond of mountain tops.

4786. Will you look at that map of East Kent, which is a lower country?—I think the map of East Kent is very good.

4787. (*Chairman.*) Do you think it would be better with the hill-shading in brown?—I should prefer it. It distinguishes the natural features more, and keeps the names clearer. There are very many other points of detail I should like to mention afterwards with regard to roads and other matters. But having looked at the hill-shaded maps, I think they would be better printed in brown.

4788. (*Mr. Roby.*) Do you think you get sharper relief in that way?—I do not see why you should not, with better mechanical work than that of these experiments, which I regard as crude and half-hearted.

4789. (*Chairman.*) I put into your hands another experiment printed in colour (Isle of Wight) photozincographed?—I do not think that the map will be intelligible to the ordinary Englishman, because he does not understand contours unless he is helped to understand them by some method of relief, either hachuring, shading regulated by slope, or the system adopted by Mr. Baddeley in the guide-books of uniform tints between certain levels, which, however, I do not consider suited for an Ordnance Survey.

4790. You think the hill-shaded map in brown would be a preferable map?—For ordinary use I think so. But what I should like to see is the hill-shaded map in brown with the contours lying on it in black, so that if I wanted the contours I could find them.

4791. Your perfect map then would be a contoured map with the hills shaded in brown?—For the hill-shading I do not tie myself necessarily to brown, but any one of these tints which would separate it from the contouring, and from the marks of human constructions, roads, houses, and the like.

4792. Supposing the map is printed with contours and without any hill-shading, would it be desirable that the contours should be printed in black?—Yes, I think it would. Of course it will depend on what colour your water is, and what colour your roads are. In many of the French maps the roads are printed in red. In that case there would be no objection to having the contours in black, but if the rivers and streams and footpaths are in black then I think black contours would lead to confusion.

4793. Do you think it would be desirable to print generally in the following colours, say water in blue, roads in brown, your towns in red, and your woods in green?—Yes, some such system is my idea of a map. Colour is essential if confusion is to be avoided.

4794. And that would be more popular?—I do not think it would become more popular at once. I think everybody of middle age has a natural inclination to the maps he has been brought up with; but the advantages of a new system would be recognised in time, and the coloured maps would become popular. I have no doubt a new map of that kind would have to fight its way against a great deal of prejudice to begin with. Probably you have been told by witnesses that the 1-inch map is preferable to any other map, and I think that arises from the fact that it is what Englishmen as a rule are familiar with. They are unaccustomed to contours and colour printings, and they are prejudiced against them, but when one has grown accustomed to them, and tested them, they prove practically to make the better maps.

4795. You were going to speak about the indications of the roads; are the roads as shown on the black maps sufficiently indicated as regards their quality?—No; I do not think they are. Contrast our system with the system made use of in the French maps or with the Italian system; you will find they have four or five different ways of distinguishing roads. The point where the English map breaks down principally is in failing to distinguish between an ordinary country road along which you can drive a pony carriage and a mere cart track, in some places something which is not even a cart track. For instance, if you take the Windsor sheet you will find that Queen Anne's Avenue, which is a mere grass ride where no carriages are allowed, is marked in the same manner as the road along the Long Walk. The metalled public road

through the park, the Queen's private road, the footpaths and grass drives, are all shown in the same way. I think the confusion in our maps may partly arise from a distinction which we alone among European nations make; we show a road in a different manner when it passes over cultivated land and when it passes over common or waste land, and that makes it, perhaps, more difficult to distinguish the classes of roads.

4796. (*Lieut.-Gen. Cooke.*) You mean the dotted lines?—Yes; I think it is partly due to that. I have broken a good many pony carriage springs by trusting to the Ordnance map in regard to roads by getting into a farm track which is only a track between two fields and all ruts and mud, and yet marked in exactly the same way as a fair metalled road. There is a difficulty no doubt in England owing to the roads not being distinguished in the same sharp way that they are in France, where you have them distinguished by the Government as National roads, Departmental roads, Communal roads, and Vicinal roads. Everything abroad is more stamped by officialism, and it is easier to represent the differences. In part of Sussex which I know well there are numbers of places where roads are marked which are now mere footpaths across the common. I do not know what there may have been years ago. No alterations except new railways have been inserted for the last 15 years, so far as I can see, in the sheets in this neighbourhood.

4797-8. (*Chairman.*) Looking to this sheet of characteristics, should you not say that the failings you refer to are due to errors in the draughtsmanship of the map rather than in the rules?—I think it is defective in the absence of any distinction between minor roads and cart tracks. It would be a less evil to have only one mark for cart tracks and footpaths.

4799. (*Chairman.*) Would it not be better to merge those two first distinctions into one road, namely, a good metalled road?—I think it would be an improvement on the present plan.

4800. And then keep the other distinction for the minor roads which are cart roads?—I should be disposed to indicate them by a broken line on one side. That is the distinction which is made on the Continent (I noticed it in the Italian map this morning) as to roads which are not always carriageable. I think it is a fair distinction to mark no road with continuous double lines which is not carriageable.

4801. Is it desirable you should know that which is a footpath from that which is a road along which you can get a carriage or a horse?—It would be desirable. I do not see why you should not indicate a cart road by a hard line, and the other by a dotted line. I think there might be four distinctions—the high road, the country road, the cart track, and the footpath.

4802. (*Mr. Primrose.*) Do you think it is necessary to distinguish between any two roads that a carriage can drive along?—Yes, I think so. I think you should distinguish a county road. There is an administrative distinction, is there not—main road and parish road?

4803. (*Chairman.*) We have at the present time the main road which is maintained by the county and the parish road which is maintained by the district. Both of these are good carriageable roads, or ought to be?—Quite so.

4804. But for map purposes is it worth while retaining that distinction; is not the distinction too fine to be distinguishable?—No, I do not think so; I should retain it. In France they have four distinctions, you only have two; I think you should be able to show the two classes of roads.

4805. (*Lieut. Gen. Cooke.*) You cannot practically carry out the difference between first and second class roads, so as to be distinguishable, without very great care?—You might narrow the second-class road a little. Of course an objection to the *Carte Vicinale* is that it marks the great roads with so much exaggeration. In our map the distinction is very fair. Here is the old West Road through Slough, and coming out of it is the cross road going to Datchet. That seems to me to be a very fair distinction.

4806. What I say is, that in the first two (first and second class roads) there is practically no distinction?—I agree as to that, so far as a driver is concerned. I should like to put a dotted line for the cart road.

4807. That is contrary to the Ordnance Survey principle. If that were done the whole 1-inch map of England, Scotland, and Ireland would have to be

altered. The distinction that a dotted line shows there is no physical feature has been adopted; it would probably be difficult to alter that now?—It is a technical matter for the Department to decide what four marks you should use. I do not think I am called on to go further than to say you ought to have four marks for different kind of tracks.

4808. Including footpaths?—Including footpaths.

4809. (Chairman.) I am told that the sheet of characteristics which I have placed in your hands only applies to the later maps, and that there has been a change of method since the sheet which you have been criticising has been published. With regard to paper in these resolutions which you have laid before me, it is said: "That these maps should be supplied to the public conveniently folded, and on thin but tough paper as well as on that now used?"—With regard to the maps being "conveniently folded," I do not know that I have a sheet here, but in France the *Carte Vicinale* is supplied everywhere folded up in a little case, ready mounted as we should call it. I think the price is 1fr. 25c., or 1fr. 50c. folded, and 75c. unfolded. I think it would be a very good thing if the agent would do that; however, I was coming to the agency business afterwards. With regard to thin paper, I think any tough paper would meet that suggestion. Something like the maps before you (the Corsican maps): this is a convenient paper and takes very little space.

4810. You would suggest that the Ordnance Department besides publishing the map in its present form, should also publish it in a form in which it can be folded?—Yes. I think with regard to the system of sale, if I ought to speak as to that, that Mr. Stanford appears to be doing a great deal to push the map and to be acting very loyally as agent here in London. I do not wish to say anything at all against his firm, but I think the requirements of the provinces are not sufficiently met. Of course I do not know any details of the contract between Mr. Stanford and the Government: but there is some failure with regard to the provinces. We may imagine it to be that the provincial agents do not get sufficient discount to make it worth their while to push the maps; perhaps Mr. Stanford makes a requirement as to ready money payment or something of that kind, or takes off his own large percentage; but, in fact, the provincial booksellers do not keep a stock and push the Ordnance maps. I understand Government are making an arrangement with Mr. Stanford now that he is to have a number of provincial agents: perhaps that may partly meet the objection. It would be a very good thing if you could have provincial agents in towns where there are a certain number of inhabitants, and at every one of these agencies there ought to be index maps so that people could easily find what they wanted by reference.

4811. Do you think it would be a good thing to have an index map and a local specimen of the Ordnance map in every post office?—I think that would be a very good plan if the post office can be got to consent to it.

4812. Is there anything unreasonable in asking the Post Office to do that?—I think Sir Charles Wilson proposed that postmasters should act as agents, and that anybody wanting the Ordnance map should order it through the postmaster, who should undertake to procure the map from the Department at Southampton. I do not know enough of Government Departments to know whether that scheme would work, but it is an ingenious suggestion, I think. I am not sure that having agents in every town of, say, so many inhabitants would answer as well. The French system is, I think, to send the Ordnance maps to any tradesman who gives a certain guarantee, and give him three months credit.

4813. Do you know that that is so?—I do not know about the three months credit; I know about the rest. Any respectable tradesman may be made agent. In the little towns in France you can buy the *Carte Vicinale*, but I do not think you can buy the War Department maps except by ordering them from Paris.

4814. The *Carte Vicinale* is really published by a private map-seller?—No, that is purely a Government map, the administrative official map of the Ministry of the Interior.

4815. Not published by Erhard?—He is only the agent.

4816. Is it not published by him?—It is a Government map.

4817. The Government supply the materials?—Yes; and the engraving; the whole map; and there is an elaborate system by which the communes have to report alterations of roads and other changes, so that it may be kept up to date.

4818. Do you know anything about that, how the Government in France are informed of alterations?—They have agents all over the country whose business it is to report, but whether they are special agents, or whether it is the business of the mayors of the arrondissements to report, or of a surveyor, I do not know; I do not know the details of the system, but they can easily be ascertained through the English Ambassador in Paris or by inviting a French official to give evidence here.

4819. Do you know anything about our Indian surveys?—Only generally from consulting them.

4820. You do not know in what way they are reproduced?—A rough and ready process. Many of the large-scale maps are photozincographed.

4821. They are produced very quickly, are they not?—Very quickly; so are the Russian maps of the Caucasus; they turn them out very quickly. I think the Indian maps are now photozincographed. There is another point with regard to sale. I think with regard to our maps, our postage arrangements are rather clumsy. In France the smaller maps are sent for a uniform charge of a halfpenny, and the larger ones for a penny. I think some concession with regard to the despatch of the Ordnance map might be made. At present, in writing for an Ordnance map, and sending the money for it, people do not know what the postage is going to be, and I know that practically this produces a good deal of friction with people in the country.

4822. Of course maps go at the ordinary postal rates?—Yes; I think we made out that for the new map it costs 1*d.*, and 3*d.* for the old, with larger sheets. 3*d.* of course is a very high charge, and 1*d.* is quite enough.

4823. You think there should be a special rate for the conveyance of Ordnance maps, because they are Government property?—Possibly: certainly a specified rate.

4824. (Mr. Brickdale.) With rollers?—Do they require rollers? If you buy only one I suppose they may. A light cardboard roller would suffice.

4825. Does the French postal rate include a narrow roller?—I think it is mentioned in that little War Office advertisement I handed to you. I think they mention how they send maps and the postage, but, at any rate, it would be a good thing if on the advertisements there was put what the postage was for our maps, and then people would know exactly what to send. They would not quarrel over a penny if they knew exactly what to send.

4826. (Chairman.) This advertisement states the bureau to which application for the maps should be made, and that the price for the map, including postage, is 55 centimes, and for the 1/200,000 map 2 francs 10 centimes, which may be remitted either by postal order or in postage stamps, the address to be written very clearly. It does not say anything about a roller. It is a very good advertisement?—It is very practical.

4827. It points out the advantages of the maps?—Then, I think, the Department have already made a point of putting keys to the technical signs on the maps. Many of the new maps I have seen have a key to the technical signs, so that a man would be able to read the map. Another point which has been urged as regards the English maps from the point of view of scientific geography, is that the depths of lakes are not given, while in the Swiss survey the depths of the lakes are given throughout, which for physical geography is very important, and in some of the modern French maps they give the depths of the water on the sea coast. I suppose it is too much to hope we may be able to come to that some day.

4828. We have the depths of the water all round our coast, but that belongs to a different department?—We have got it in the Admiralty charts, but not in one map, with the land features. I think that in the selection of names more care might be taken in the reduction from the 6-inch map; of course it is a difficult matter. Take the Windsor sheet, I do not find either Surley or the Brocas or the Eton Playing Fields marked.

Mr D. W.
Freshfield.

6 June 1892.

4829. I think Surley and the Brocas should be marked, certainly?—There are a good many names which are certainly of no particular value. Another point I noticed. I tried to find the height of the Castle Hill. I could not find that anywhere on it. I think the heights given are not always the best positions. I take the Windsor sheet, but I can point out the same thing in different parts of the country. Of course it is a most difficult thing to select the names that are most important, but I think it might be better done.

4830. Do you think it would be practicable to submit a proof of this map before publication to somebody or to some persons in each county to look over with regard to names?—I should think it might be.

4831. It is clearly impossible for a person who has only general and not local knowledge sitting down before a map to pick out what names should be left out and what names should be left in?—I think it is quite impossible.

4832. That can only be done by persons with local knowledge?—Yes.

4833. Would you recommend that an attempt should be made in that direction and proofs submitted?—I should. First sheets might be locally exhibited and suggestions invited, or they might be sent to the clergyman of each parish, and in towns to the mayor. I should think a local authority could be found who would take a little trouble. In many cases you would find a particular person who was a good authority, and the officer who had been in charge of doing that particular bit of work would learn whom to apply to. The Swiss Survey habitually consults residents and even chamois-hunters.

4834. In that way the map might be made more accurate in regard to this point about names?—At any rate the locality would have no right to complain afterwards if they had not taken the trouble to make suggestions. The only other thing I should suggest is that, as on some of the foreign maps, the date of the tirage is put, so on our maps the date of the printing of the map should be put on the corner of the map so that anybody looking at it might know when it had been issued from the Survey Office. I think this is now done; it was not formerly.

4835. (Mr. Brickdale.) Do you think the date of the printing or the date of the survey is important?—Where the sheet has been extensively corrected I think both the date of the survey, and of the re-survey, should be given. In the foreign maps both are given, executed on such a date, corrected on such a date, printed on such a date. Then they go on to give you the names of the officers concerned in it. I am told our system would not admit of that; no one man is sufficiently responsible for any bit of work to allow of his name being put on it. This points, I infer, to a defective responsibility.

4836. (Chairman.) Have you seen the newly published map of England and Wales on the scale of 4 miles to 1 inch?—Not to examine it.

4837. Has your attention been drawn to certain articles which have appeared in the public press on the subject?—I saw those articles. I have not read them with very great care, and I should like to say that I have made inquiries and that no one connected with the Royal Geographical Society knows officially or non-officially anything of the authorship of the articles. I have only just glanced at one of the sheets of the map. I have not studied it at all.

4838. It is stated to be an old map although newly published, and that the railways have been corrected up to date, but nothing else. Would you kindly look at it and tell me if you think that map if corrected up to date would be a satisfactory map as a large-scale map?—After looking at the article I imagined the defence of the Department would be that the map was meant only for a railroad map, and that therefore as long as it was a representation of the surface features of England, it did not matter whether the other details were behind the age. I was looking at the London sheet before I came down, which of course represents many things with regard to the habitation of the country which have entirely altered.

4839. Do you consider the "Times" criticism of the 4 miles to the 1-inch map fair and reasonable?—I have not noticed what description is given in its title. If it is described purely as a railroad map, then I do not think there would be much ground for complaint, but

if it is described as a general map of England, then I think it ought to be said that the towns represent the towns of a great many years ago, and the roads are equally obsolete. For instance, I imagine that the roads in the west country are all taken from the old survey, which of course leave out many about Exmoor and Cornwall and in other parts. The extent to which I should condemn the map entirely depends upon the description which is given of it.

4840. Mr. P. This is how it is described in the last report, at least I suppose that is the same map?—"Just published: Ordnance Survey. A general map of England and Wales, showing county boundaries, railways, rivers, canals, roads, and principal parks on the scale of 4 miles to 1 inch." The title "general" is very misleading, saying anything about towns, it does not "show" them. I think it is a pity that description should have been given of the map. It may have been desirable to publish a railroad map, and this may have been the only convenient map for the Department to put the railroads upon; but I do not think this is an adequate explanation or excuse.

4841. (Mr. Roby.) I think we had it in evidence that it was originally produced for certain uses of the Geological Survey, and it was merely published because it was thought it might be useful for railroad purposes?—There is nothing about that here.

4842. But the fact that it is an old survey appears on the face of the map itself?—Yes.

4843. (Chairman.) Is the style of that map satisfactory? Supposing the engraved plates of that map were corrected up to date, would that be a creditable map to produce?—Simply as a road map and a railroad map.

4844. Yes?—I do not see anything the matter with the style of it; it is very clearly printed.

4845. It is good engraving?—Certainly; the names are very nice sharp engraving. If a railroad map executed in this way had been reduced from the new 1-inch map, I think that there would have been nothing to be said against it. The only reason to be given it was produced from an obsolete survey.

4846. The new survey not having been completed, it could not be produced from that?—It is almost completed.

4847. The real explanation, I believe, is that the map had been made for geological uses. As it was in existence, it was asked that it should be printed?—A. I look at the whole matter, it was an accident, a rather unfortunate accident, which gave a fair opening to criticism. But I thought somewhat exaggerated importance was attached to a minor matter, minor that is in comparison to the more radical defects in our system, on which I desire to concentrate attention.

4848. (Mr. Roby.) There is one question I should like to ask with reference to the comparative speed with which the publication of the French maps has been carried on. Have the French completed their 1-inch or 1:50,000 survey for the whole of France?—The Carte Viciinale is about three-quarters completed and published. It was begun in 1870. The War Office map on the scale of 1:80,000 is of course all finished. With regard to the speed with which the work has been accomplished, I do not think it is explained by the fact of their having the trigonometrical work done. Each of the French Departments appears to do its topographical work separately.

4849. Mr. Primrose. Sir Charles Wilson explained that with us the Topographical Department was kept working because we reduced from the 1:50,000; the French do not do that?—They work on a much smaller scale to begin with. I think that is why Sir Charles Wilson has such great difficulties; he has to begin on such a large scale and publish maps on a large scale, practically plans. I do not think there is much to be said against the Department at Southampton; I think the difficulties are elsewhere. There is certainly one difficulty in England which I find in the Royal Geographical Society's work, viz. that the English map-drawman is not as skilful as the French as the foreign workman; he is the slave of conventional signs and symbols, and is apt to slur over local features. The map you employ has not been taught map construction as the boys are in the schools in Zurich.

4850. Does the Royal Geographical Society undertake some obligation in connection with the Survey to return for the grant that the Government make them?—Our obligation to the public is to keep a map collection, to

city, and he would have no means for getting it unless he got it copied from their plan.

4886. He would have the plan; all he would have to add to his plan would be the parochial number?—Yes.

4887. At present on every revision it may be expected that a considerable number of numbers throughout the parish will be changed?—Yes.

4888. So that the numbers on the sheets of one edition will not be the same as the number on another edition?—Yes.

4889. And yet they are official numbers?—Yes.

4890. And consequently capable of creating confusion when being referred to?—The best way to get over that might be to allow the overseers, the assessing authority, to put their own numbering on entirely.

4891. That is rather the point I was asking you; whether it might not be as well to omit the numbering of the plots altogether on the Ordnance maps?—For all purposes?

4892. For all purposes; simply printing areas?—I am afraid it would lead to a good deal of confusion in time to come.

4893. Would it lead to greater confusion in time to come than what is likely to occur now, namely, two editions of that map within 15 years; you will find (say) 654 in one part of the parish in one map and in another part of the parish in the next edition?—Yes, that is certainly bad; especially from the point of view of using the map for title purposes for conveyance. I dare say, as you know, lawyers are most anxious to adhere to the old description of parcels, and when one suggests to a lawyer using an Ordnance sheet or tracing an Ordnance sheet to attach to a contract, he says, "Oh, I have got a description of a parcel here and your Ordnance sheet does not help me in the least; it is not anything like it." He wants to stick to the old description, and I am afraid they will have the same thing to deal with. If you once start with numbers and could carry right away through the same number, it will get rid of the difficulty of the use of maps for the purposes of registration of titles.

4894. For the purposes of title, would not you say, "as coloured in the accompanying map"?—Yes, it could be done by colour.

4895. Or "as numbered on the sheet of a certain year;" it is quite clear that the numbers on the Ordnance maps are not permanent?—Yes.

4896. (*Lieut.-Gen. Cooke.*) Supposing the numbers on the plots were done away with altogether, could not the areas be made use of in the same way as the numbers now are; that is to say, you might refer to a plot that it was 149 of an acre, instead of referring to a plot as No. 22?—The only objection that I see at once to that is where boundaries are done away with, which very often happens.

4897. That applies equally to the numbers and to areas, does it not?—It does undoubtedly, but not to the same degree, I rather think.

4898. (*Mr. Roby.*) If you threw two plots together you might have two areas?—Two numbers and the double area.

4899. If you divide a plot and say part of area 1349 is part of the plot 3124?—Yes. I rather lean to the conclusion that if you are bound, as I understand from the Chairman, to alter the numbers, or I will not say bound, but if the numbers are altered every 10 or 15 years, I certainly think it would be better to omit them altogether; and of course they are liable to be altered, from the very fact of boundaries getting altered.

4900. (*Mr. Roby.*) The practice hitherto has been to re-number entirely the parishes when the boundaries of the parish have been altered.

4901. (*Chairman.*) Something very like that?—Yes.

4902. (*Lieut.-Gen. Cooke.*) Then you must bear in mind that when a map is published with altered numbers, a new date is put to it?—Yes.

4903. So that you would always refer to the number that is on the map of the date 1880 or 1890?—Yes.

4904. (*Chairman.*) Do you know the practice in France with regard to the use of maps for the purposes of rating?—No, I do not know at all.

4905. (*The Chairman stated to Mr. Fuller the method in France.*) Do you think the French system would be applicable to our present maps. They have the map

numbered, and the numbers belonging to a proprietor are entered in a page of the ledger as belonging to that proprietor, and he is rated on that page; very much like our rate-book, only that it refers to a map?—Yes, it refers to a map and also it has the columns in it for adding or deducting what is bought or sold.

4906. You see we have the cadastral map, but our valuation list does not refer to a map. Would it be practicable and convenient to make our rate-books refer to our cadastral map?—Yes, I am certain it would in agricultural districts.

4907. Your objection in town districts is that the towns change so often?—Confusion; yes.

4908. Would there be any greater difficulty in the town. Four or five properties are thrown together for the purpose of building; they will pass out of the ledger accounts or the rate-book account of these proprietors and a new account would be opened for them, or they would be grouped together, and the map might be temporarily corrected in the office and ultimately be revised by the Survey?—Yes, the difficulty I see there, is not where you get the four or five properties thrown together, but where you get four and a fraction in one property and three and a fraction in another new property or another new rating where there are no old boundaries, and where you get absolutely new boundaries to deal with.

4909. You would show that on the map?—Yes.

4910. And you would reconstitute your area?—Yes, if it could be done in that way by the authorities themselves keeping their map up to date, certainly. That objection, which is the one vital objection that I see, would disappear.

4911. Well, would it not be more convenient to the authorities than the present method?—Well, in the present method, they give a hypothetical number of their own manufacture, and there is nothing in the rate-book to say what the property may be. You must take the extracts from the rate-book and go and see the property. That is before you can form any idea of what area is comprised in the separate hereditament.

4912. This map would be an advantage?—The map and the rate-book together would be an advantage undoubtedly.

4913. You see I have already suggested that the parish should number its maps itself?—Yes.

4914. It would then have simply to readjust its own numbering?—Yes.

4915. It would show that No. 1 and No. 2 had run into one another in certain proportions?—Yes.

4916. And by a very rough drawing on their own plan they will make their plan correspond with the correction on their valuation list?—Oh, yes, it is quite practicable. I am not suggesting that it is not, but from what I know of overseers and their officers, the great majority are not capable of correctly drawing a plan. The clerk to the overseers, who in the country is often a tradesman in a small way, would have to make these alterations. In Devices, in two cases the clerks to the overseers happen to be publicans.

4917. Probably you think that for valuation purposes you as a surveyor would like to make use of the map, while they as parish officers would prefer not to be bothered with the map?—I think that is very likely.

4918. They prefer the book system without a map?—Yes, notwithstanding the fact that the map and the book together would be for the purposes of people, other than the officials who are continuously dealing with matters of assessment, much better.

4919. (*Sir A. Geikie.*) Supposing that the parish numbers were changed and that from time to time new editions of the map were used and referred to for rating purposes, I suppose there would be no practical difficulty in having copies of successive editions kept for reference in these public offices?—No, I do not think so; now at the present time the numbers are altered every five years.

4920. Yes; but what I meant was, supposing that you referred to a particular parcel of land by a particular number in a particular year—of course the numbers are altered—would it be possible in these public offices to have copies of the successive editions preserved for reference so that there might be no dispute as to what a particular parcel of land might be?—Oh, I think so.

4921. (*Chairman.*) Supposing the town surveyors were under the obligation to supply to the Ordnance

Mr. H. H. Fuller.

19 July 1892.

Mr. H. H.
Fuller.

19 July 1892.

Department every year tracings from the Ordnance map of all alterations that take place; would that suffice, do you think, to keep that map up?—Yes; very much the same question was asked before, but it gives me a suggestion that possibly the borough surveyor might supply to the rating authorities a corrected plan every year.

4922. Supposing that were reversed, Mr. Fuller, and the borough surveyors supplied the Ordnance Department with the drawing, then the rating authority was to get from the Ordnance Department a corrected tracing of their town map?—Yes, as long as there was no great delay in the supply or rather period of time between the supply by the borough surveyor and the time by which the rating authorities could get the map complete. It is very important, you see, to have it up to date—really up to date. There is one point which I have made a note of here, and that is that the numbers in the urban districts—in the city, for instance—if you will allow me to mention that, as I know it so well—that areas in the city would be useless unless you could give them in square feet. I mean to say it would be useless to talk about '025 of an acre when you are dealing with city properties.

4923. (Mr. Roby.) Square yards would do, I suppose?—Square yards would do.

4924. Square yards are generally what you deal with?—In London square feet.

4925. (Chairman.) Areas are not supplied with town plans?—No, they are not, but following up the idea of leaving out numbers altogether, and basing a reference on areas—

4926. These areas would have to be stated?—The areas would have to be stated; the numbers would have to be stated.

4927. (Lieut.-Gen. Cooke.) The numbers and areas refer only to 25-inch, not to town maps?—Yes.

4928. (Chairman.) Have you ever tried to compute from the Ordnance town maps areas?—Oh, yes, we are doing it continually.

4929. Can you do it with sufficient accuracy?—No; roughly only.

4930. On 100 square feet how near would you get?—Ten by ten; that would be very small indeed.

The witness withdrew.

Capt. W. J. L.
Wharton,
R.N.

Captain W. J. L. WHARTON, R.N., Hydrographer to the Admiralty, called in and examined.

4942. (Chairman.) You are Hydrographer to the Navy?—I am, sir.

4943. Has your attention been turned to the 1-inch maps?—In a general way.

4944. You are aware that they cease at low-water mark?—At low-water mark.

4945. And it has been suggested that it would be advantageous that some of the indications which appear on the Admiralty charts should be included in the Ordnance 1-inch maps?—Yes.

4946. Do you see any difficulty in making arrangements which would enable that to be done?—None whatever. We could supply the depths for a sufficient distance from the coast on a sufficiently large scale to enable them to be put down with sufficient accuracy on the 1-inch maps.

4947. What scales are your charts on?—Various scales; they vary from 12 inches down to a half-an-inch to the mile in the case of the charts of England. We always go by the sea mile.

4948. (Mr. Roby.) That is, the geographical mile, not the statute mile?—The geographical mile, not the statute mile. But in cases where we publish a chart on a scale of only half-an-inch to the mile, we should be prepared to supply the original surveys, which are always on a larger scale, from which the Ordnance could reduce whatever they wanted.

4949. (Chairman.) Probably the $\frac{1}{2}$ -inch scale would supply sufficient indications to add to the interest of the 1-inch map?—I do not think that you would find that any map-maker or chart-maker likes to enlarge. We already occasionally supply to the Ordnance Office our original maps for revising the low-water lines, and we always give them the largest scale; they always ask for the original surveys, so that they can reduce themselves.

4931. Well, we will say 1,000 then?—Oh, I should think you might get within 25 square feet, carefully doing it.

4932. (Lieut.-Gen. Cooke.) If you got manuscript copies of the original plans you could do it much more accurately. Of course a good deal of error depends on the expansion of the paper in printing. If you were supplied with tracings from the original manuscript plans you would be able to do it much more accurately?—I think a careful man would be able to get very close up to the area, but if he were a careful man he would not be satisfied with that.

4933. He would measure on the ground?—He would measure on the ground.

4934. Whatever plans he got he would measure on the ground?—Yes. I had a case in St. James's Street; I could not make up my mind, so I went and measured on the ground.

4935. How near were the measurements?—We were 3 feet out in the length; the depth was right.

4936. What length?—103 feet.

4937. (Mr. Roby.) The measurements on the plan were 3 feet different from the measurements on the ground?—Yes, that is really what it was, and I assume from that that the paper here where the scale is given had not contracted or expanded in the same proportion as it had where we were measuring; the 5-foot scale gave us a difference of about 3 feet.

4938. (Chairman.) And that in a valuable property is an important difference?—Oh, it was very important, because it was a question of valuation of super area, and the difference of 3 feet by 40 feet deep would make a considerable difference in that valuation.

4939. Thirteen square yards?—Yes.

4940. Have you any other matter?—No; there is no other matter on which I have not touched, with the exception of town maps on the 6-inch scales. We occasionally come across cases where it would be very convenient, when the town happens to come on two sheets, if we could get one sheet on which it was given.

4941. All included, a combination sheet?—A combination sheet of towns only.

4950. So that at present your maps fit the edge of the 1-inch map?—No, not always, as we survey our own low-water line. I do not know in what cases it is that they ask for ours, but they only ask us occasionally. It is not the regular thing. Where I think they know a great change has taken place—a place like Morecambe Bay where the sands change every year—it is not worth their while to re-survey these sands for that purpose when the latest maps in two or three years would be all altered again; they ask us for our survey so that they have the sand a little nearer than they have it from the older survey.

4951. (Mr. Roby.) Have you a complete survey of the whole coast on a uniform scale?—No.

4952. Pretty nearly so?—No; not on a uniform scale. We have always got to bear in mind the size of the charts. The Ordnance Survey of course publish on a certain scale, and they do not care where the limit of the sea comes; but in our own case, providing for sailors, we always have to bring in certain salient points or bays or whatever it may be, so that the sailor may sicer on one chart—from one point to another. Consequently our charts are constantly varying. We endeavour as far as we can to publish them on the same scale. But the same thing occurs also on the original survey, because there we survey a well-navigated channel on a much larger scale, so as to get it more accurate than we do an open piece of coast.

4953. Would not the chart of the Bristol Channel be on a different scale from Lundy Island?—No, it is not; you are speaking now of the published chart.

4954. The published chart?—We have four or five of the Bristol Channel, we have the general chart for the whole of it; then we have it in three or four sheets showing different parts of the coast. Then again we have a much larger scale at the head of it showing the

approaches, a very large plan of Penarth Roads, and so on; we have different plans.

4955. Charts adapted to the convenience of sailors?—Charts adapted to the convenience of sailors, yes; there is no uniform scale map.

4956. (*Chairman.*) On some scale or other you have a chart all round the coast completing every bit of coast?—Oh, yes.

4957. (*Sir A. Geikie.*) You survey a mile or so inland, do you not?—We always take that from the Ordnance survey.

4958. But in some cases you have not done so; in cases where there was no Ordnance survey you have actually surveyed yourselves, in the Hebrides, for instance?—Oh, yes, some years ago there was a good deal of surveying done by naval surveyors of the land of England, but now we invariably take from the Ordnance survey, but we have to look out for changes. Of course the Ordnance maps are not correct; our surveyors have to see that all permanent buildings that may be useful to us are added.

4959. Then, is there anything else taken from the Ordnance survey; for instance, the map of the fore-shore, do you take that from the Ordnance survey?—Yes, we take that from the Ordnance survey.

4960. (*Mr. Roby.*) The delineation of the cliffs?—Yes, all that.

4961. (*Sir A. Geikie.*) Then, your charts begin at low-water mark?—No; we survey up to high-water mark.

4962. Whilst you survey up to high-water mark, you take the inland from the Ordnance?—Yes.

4963. (*Chairman.*) The inland marks you take from the Ordnance, Chichester spire, for instance?—Certainly, we should take them from the Ordnance; that would be taken from the Ordnance triangulation; such a conspicuous thing as that of course would be the foundation of our chart laid down from the Ordnance triangulation.

4964. So far you work together; you do not institute a new triangulation for yourselves?—Oh, no; the Ordnance supply us with all our triangulations; we start from that and fill in what we want.

4965. I believe you do not publish your own charts?—We do not engrave them in a Government office nor print them at a Government office.

4966. You draw them?—We draw them.

4967. Then what are your arrangements as regards engraving the publication?—They are done by private firms by contract. When I say "contract" perhaps that is not the word, because each plate has to be appraised.

4968. Do you make arrangement with one publisher or many publishers?—Well, there is no publisher; we are our own publishers; we simply sell through an agency and we print by a private firm, and we engrave by other private firms.

4969. You employ a private firm to engrave?—Yes.

4970. And you employ another private firm to sell?—A private firm to print and another to sell.

4971. (*Mr. Roby.*) In fact you have three classes of private firms?—Yes.

4972. Engraving, printing, and selling?—Yes.

4973. Have you any difficulty to get as much uniformity of style as you want?—No; none.

4974. You do not insist on absolute uniformity?—Well, pretty nearly.

4975. Do you vary your engravers and printers much?—No; we have a certain number of engraving firms whom we employ; their engravers have got into the style requisite for the work and we employ them continually.

4976. (*Mr. Primrose.*) Is it engraved on copper?—Yes, on copper.

4977. (*Sir A. Geikie.*) Are the maps printed from the copper-plates?—Yes, from copper plates.

4978. Those copper-plates wear out then?—Yes, but we steel them.

4979. How often do you publish a new edition?—We never publish a new edition; or rather we are always publishing a new edition; the very smallest addition goes in instantly—goes down on the plate—and no chart is sold after that without it.

4980. All the old stock is cancelled?—We do not keep much old stock; we do not allow the agents for sale to have more than a certain number, which varies, according to the way in which the particular chart is wanted for sale, for the reason that the moment a fresh correction comes in—and I need not say they are pouring in every day, all those charts in his hands are cancelled or corrected by hand, so we have a comparatively small number to cancel. We only print by half-dozens and dozens at a time as a rule.

4981. (*Chairman.*) You must have a great many plates?—We have about 3,000.

4982. (*Sir A. Geikie.*) Of the British Isles?—Oh, no; for the world. Of the British Isles I cannot tell you offhand; perhaps 350.

4983. (*Chairman.*) 350 plates for the British Isles?—Something of that sort.

4984. And they are distributed among different printers?—No, one firm prints for us.

4985. All the plates are there?—All the plates are there.

4986. When any plate is altered you order, say, the impression of plate No. 1, kept by that firm, to be destroyed?—The printer keeps none; he supplies either to us for the surveys of the fleet, or he supplies to the agent for sale, and he is not allowed to supply more than a certain number to the agent at a time, so that the agent has never a very large number to cancel. Still, in the aggregate there is a very large destruction that way, and of course we endeavour to keep the stock at such a figure that the agent may have a sufficient number of charts to supply any sudden demand from the public, and at the same time that the number of charts to be destroyed may not be excessive.

4987. (*Lieut.-Gen. Cooke.*) Then the agent is paid for the number destroyed?—He gets new ones in lieu.

4988. (*Mr. Roby.*) Who keeps the actual stock of copper-plates?—The printer.

4989. Are the plates continually going to and fro between the printer and the engraver?—No, because the alterations are all made by engravers employed by the printer. The original plates are made by special firms; and sometimes when there is very much correction to be made we send it out to another man; but as a rule the printer does the corrections.

4990. (*Chairman.*) Have you any relations with the Stationery Office?—They only supply us with the paper.

4991. They supply the paper?—We have no other relation.

4992. Has the paper supplied given satisfaction?—Well, at the present moment, yes; but we have had a great deal of difficulty. Often and often we have asked the Stationery Office to promise to employ the same firm as long as they gave good paper, and to give us exactly the same kind of paper; we have had very great difficulties by getting different lots of paper that expanded in different directions, or did not take the ink, or destroyed our copper-plates by having too much acid in them. We have had no end of difficulties.

4993. (*Mr. Roby.*) Your paper is all stout paper, like that used by the Ordnance Survey?—No, it is not so stout as that; we have two kinds of paper, because all the charts for the Navy are mounted on linen to prevent their tearing, so we print those on a thinner kind of paper. We can afford to do that because they are mounted on linen to prevent the paper being torn.

4994. What kind of paper is it; is it called "Evans' tough paper"?—No, I think not; but I have not much to do with paper.

4995. (*Sir A. Geikie.*) Then besides printing in black in your charts there is a certain amount of colour in some of them, the lighthouses, for instance, are coloured yellow; is that all done by hand?—That is all done by hand.

4996. Is that done by the printer?—That is done by the printer.

4997. (*Chairman.*) Do you think you could arrange better for the paper if you had it in your own hands?—I do not think that we could. For the last year we have been going on very well. Now if the Stationery Office will only stick to their promise we shall be satisfied.

4998. Only for 12 months you have been going on well?—Well, only for 12 months we have been going on well.

Capt. W. J. L. Wharton, R.N.

19 July 1892.

Capt. W. J. L.
Wharton,
R.N.

19 July 1892.

4999. Previous to this 12 months' experience were you very irregular?—Oh, very irregular indeed; but I think the Stationery Office now understand that it is absolutely necessary that we should get uniformity of paper.

5000. Have you had any conference on this subject with the Ordnance Survey Department?—No, we have not.

5001. You have not tried together to arrange another system for paper supply?—No.

5002. (*Mr. Roby.*) You have one thin paper and another for sale to the public?—For sale to the public we have a thicker paper, because the public wish to get their charts as cheap as they can, and they prefer to get them unmounted, as a rule, so a thicker paper is supplied to them.

5003. (*Sir A. Geikie.*) Is that a Whatman paper?—No.

5004. (*Chairman.*) Do you see any objection from a nautical point of view to showing soundings on the 1-inch map and the 6-inch maps of the Ordnance survey?—None whatever; but we have not in all cases surveys on the 6-inch scale. I do not think anybody would use them for navigation.

5005. You do not think any danger would arise?—I do not think so.

5006. You would be adding a little interest to them and yet giving no guarantee?—I think it is highly desirable.

5007. (*Mr. Roby.*) Do you use contour lines at all for the depths?—Yes.

5008. Not merely the depths marked above?—No, contour lines as well; of course they are only supposed to be approximate.

5009. (*Chairman.*) If any soundings are shown on the Ordnance maps, I suppose you think they ought to be shown almost in the same profusion that you put them on with?—Oh, no, I think not. I should not advocate that at all. I merely contemplate a sufficient number of soundings to enable anybody to see what the sea was like off the coast. I should deprecate more.

5010. Pains should be taken so as not to indicate to the public that it was a chart?—Yes.

5011. (*Mr. Roby.*) I suppose boatmen round the coast are not in the habit of using your charts?—Oh, dear no.

5012. (*Sir A. Geikie.*) Your attention has been called to a question arising with regard to the depths of the lakes throughout the country. Some time ago, perhaps you are aware, a discussion was raised as to whether it was the duty of the Ordnance Survey or the Admiralty to ascertain the depths of the lakes of the country; have you any opinion on that subject?—I think it has nothing to do with the Admiralty whatever. I am most decidedly of that opinion. The Admiralty issue their charts solely for navigation; we cannot consider lakes.

5013. In some cases they have done so?—Yes, it has been done; Loch Lomond was done by the Admiralty surveyors; that was done a great many years ago.

5014. (*Mr. Roby.*) It depends whether the lake is open to the sea or not?—Yes.

5015. (*Sir A. Geikie.*) In the case of Loch Ness and those lakes, that is naturally a part of the Admiralty's work because it has a sea communication?—Oh, naturally.

5016. There would be no difficulty in your supplying a number of surveyors for the purpose?—There would be very great difficulty. I have no spare surveyors; I am very short.

5017. (*Chairman.*) You think if you were asked by the Ordnance Survey to make a survey of the lakes, you would be unable to comply with their request?—I should certainly decline.

5018. The landmen must do it themselves, although it is connected with the water?—In my opinion they must; we are very short-handed now.

5019. (*Mr. Primrose.*) Have you a distinct staff for this purpose—the men who actually do the soundings—have you a separate staff employed exclusively for that?—Yes; that is to say men are trained in each surveying ship.

5020. Do you employ any particular ship that happens to be free?—Oh, no; there are regular surveying ships,

whose sole duty is to survey; there were some 10 of them in the list last year.

5021. (*Chairman.*) With regard to what you said about corrections: all information that you receive from any part of the world is put upon your plates with the smallest possible delay?—That is so.

5022. And re-published?—That is so.

5023. And you have about 3,000 plates?—3,000 plates, yes.

5024. Altogether. And how many of those plates do you suppose get corrected every year; what per-centage of them?—I should think about 30 per cent.

5025. (*Sir A. Geikie.*) And these corrections are made by your own surveyors, I suppose?—Not all of them; we draw from foreign Powers.

5026. You accept corrections made by others than your own staff?—Yes; of course we have to exercise discretion in accepting corrections from other sources.

5027. (*Mr. Roby.*) And what kind of corrections are they; chiefly new elevations on the land or errors in the soundings?—Principally new rocks and shoals. Those are the smaller corrections that we get from all sorts of sources; and then there is the result of our own surveys which are constantly going on. There is the result of surveys, such as the French and American, and different surveys of different nations which are constantly going on, which are constantly sent to us, and we have to correct our charts therefrom. A very large part of our work is correcting.

5028. Do you survey a great many parts which do not belong in any way to the British Empire?—Yes.

5029. They are places where British ships are likely to go?—Yes; mainly, of course, Her Majesty's ships; that is the first consideration. But we endeavour to combine the needs of trade as well.

5030. (*Sir A. Geikie.*) Are the Admiralty surveys of foreign countries sent to you regularly as soon as they are published?—Yes.

5031. And do you supply foreign Governments with Admiralty charts?—Yes, there is a free interchange.

5032. (*Chairman.*) Tell us what is your expenditure, on your survey department, I mean; the drawing department?—Well, I do not take anything for the staff; but it is 16,000*l.* a year for the printing and engraving.

5033. (*Mr. Roby.*) The persons employed are all paid as part of Her Majesty's Navy?—Yes, those who make the surveys.

5034. (*Chairman.*) That does not include the survey vessels; this is merely the publication department, their correcting from charts and keeping up the drawing office costs about 16,000*l.* a year?—No, that is not keeping up the drawing office, because those are salaried officers; that I do not include. I merely gave you the sum that I have in the Estimates for paying for printing and engraving that we actually pay out in cash.

5035. And how large a staff have you in the drawing office numerically?—Nine; but we employ extra draughtsmen outside.

5036. Another 20 or 30?—No; occasionally another four or five.

5037. (*Mr. Roby.*) Are they all civilians?—No, some of them are our own officers, and some civilians.

5038. But the actual detailed survey is done by sailors, I suppose?—Entirely.

5039. Who are borne on the Admiralty Vote?—Yes.

5040. (*Sir A. Geikie.*) Are there any points on which you think there should be closer relation between the Admiralty Survey and the Ordnance Survey; any points where you think there is a chance of improvement on the relation where you could help them or they could help you?—No, I think not.

5041. Are you quite satisfied with the present relations?—Quite satisfied; we got all we want, and they get all they want, I think.

5042. (*Chairman.*) You are quite satisfied with the publication arrangements?—Well, that is rather a difficult question, because it is most decidedly inadvisable to be depending, as we are, on one firm for printing the charts. It is a largish business, and there certainly is no other firm, if anything should happen

to them, to which we could at once turn to taking up the work which they do for us.

5043. Who is the firm?—Malby and Sons.

5044. (*Mr. Roby.*) Does the work you give them occupy a large portion of their staff?—Yes, they have a large portion of their staff employed in doing nothing else but our work; they are large printers and lithographers.

5045. Would there be any practical difficulty in the taking that over altogether by the Government?—There would be no difficulty except the cost. I have no doubt that it would be more expensive if a Government establishment were set up.

5046. (*Chairman.*) You have never thought of making use of the Ordnance Survey Department at Southampton for the printing?—I think that would be impossible; quite impossible. It must be close to where our charts are prepared.

5047. It would not be sufficiently under your control?—No, it would never do. I do not know if you are going at all into the question of the method of sale of the Ordnance maps, but you might perhaps like to know our system as to that, because I think the differences that exist between it and the Ordnance system have seriously affected the sale of the Ordnance maps. We have a single agent, to whom all our charts for sale are supplied. He has in different parts of the United Kingdom and all over the world sub-agents, to whom he supplies charts for local sale, and we allow the prime agent 40 per cent. discount, or as it is put 25 per cent. trade discount and 15 per cent. commission and risk, and we also allow him when he has the charts by dozens, 13 to the dozen.

5048. (*Lieut.-Gen. Cooke.*) What does risk mean?—Risk means the loss of charts in sending out to his sub-agents. They may get lost or damaged, and there is always a certain amount of destruction; the upshot is that he gets about 43 or 44 per cent., and we find that that encourages him to sell as much as he can, not only himself but through his sub-agents.

5049. (*Chairman.*) Do you know what he allows his sub-agents?—He allows them 25 per cent.

5050. (*Mr. Roby.*) And when do you require him to pay?—He pays every month.

5051. Simply on account of sale?—Yes.

5052. Then when he gets six from you or a dozen from you of a chart, does he simply get them consigned or are they actually bought at the time?—They are put down to his account.

5053. He pays you within a month after he has had them?—Yes. We only sell to him.

5054. And he buys out and out?—He buys out and out.

5055. Subject to replacement?—Subject to replacement of any charts in his hands that are cancelled, or any charts in his sub-agents' hands, provided they are returned within a certain time. We decline, of course, to receive the stock of a man two or three years old and replace them.

5056. And the quantity that he has of any particular chart, is that taken back by you?—It is returned to my office and destroyed.

5057. Then you force your charts upon him?—I thought you meant the other way; we do not allow him to have more than a certain number.

5058. You do not send him a dozen if he says he only wants 10?—Oh, no; he demands. He is always looked after to see he does not get too many.

5059. (*Chairman.*) Your terms are very much better than the Ordnance Survey terms?—Yes, that is the point of importance. They only give Stanford 33 per cent. and that is not enough I feel convinced to induce him to push the sale in other parts of the kingdom, and the result is very great inconvenience to anybody who wants to get a map unless he is in London. We have been attacked by the Treasury on the subject of the large discount we allow to Potter, the firm in question, but we have been able to convince them that it is the best plan.

5060. Stanford's terms to his sub-agents are apparently the same as your agents' terms to his sub-agents?—Yes; and he has got a very small margin.

5061. He has got 8 per cent. margin?—Yes.

5062. (*Mr. Primrose.*) Is the amount that you have to write off every year for maps withdrawn a large one?—It amounts to about I dare say 10,000 sheets a year.

5063. (*Mr. Roby.*) What do you reckon each sheet at generally; 1s.?—To us; no, not so much.

5064. The selling price?—The selling price varies at from 1s. to 4s.; but the printing price, the average of that, I suppose, is about 6d.

5065. One shilling to 4s.; is that according to the superficial size of the sheet or according to the details?—Both.

5066. (*Sir A. Geikie.*) Then from the sale of your maps after giving his commission to your agent is there any margin of profit left over; I mean on the mere cost of production?—Oh, yes, a great deal; say it costs us 3,000l. to print, we should receive about 9,000l.

5067. (*Lieut.-Gen. Cooke.*) What exactly do you put into the cost of selling the map; what part of the production do you put into the cost of selling the map?—Well, that is a difficult question to answer. The price of the maps—the average price—was settled a very long time ago, and we continue the principle; it depends upon, as I say, the double-elephant sheet; the ordinary double-elephant chart we should charge 2s. 6d. for. If we take the cost of the survey and the cost of the engraving it would have to be a great deal more.

5068. But in the sum you have stated I suppose you begin after the copper-plate is completed?—Yes.

5069. You stated that you gained 6,000l. on 9,000l.?—Oh, yes, on that; simply on the printing I am speaking.

5070. It begins when the copper-plate is completed?—Oh, certainly.

5071. (*Chairman.*) In fact your expenditure after it has gone away from the Admiralty?—After engraving.

5072. (*Mr. Roby.*) Have you adopted any other process for producing your charts?—Only in a small degree; the constant correction that takes place renders it almost impossible for us to use zinc to any extent: zinc prints clearly; but if you only print copies by sixes as we do, and you are constantly correcting them in a very short time, it blurs.

5073. And do your copper-plates stand constant correction?—Yes, but you occasionally get a hole in them.

5074. (*Lieut.-Gen. Cooke.*) Do you make duplicates of your copper-plates?—We are just beginning to do it now; that is a thing I have been trying to get for a long time.

(5075. (*Mr. Primrose.*) By the electro-type process?—No, we have a process of our own—acid process; a combined photographic and acid process.

5076. (*Mr. Roby.*) What is the result of your process; do you get another copper-plate?—We get another copper-plate: it is very much quicker; it is not so fine as the electrotype process, but it is much quicker and much cheaper, and answers our purpose.

5077. (*Sir A. Geikie.*) Do you intend to print from that second copy and keep the original?—In some cases we print from the original and in some cases from the second copy.

5078. You mean to have one copy untouched?—No. The object is to have them in two separate places. All our plates are now in a vault in the middle of London, and although of course every pains have been taken to make the vault strong, we cannot consider any place absolutely safe, and it is desirable to have second plates in case of accident.

5079. (*Mr. Roby.*) Is the vault under your control?—It is under our control in a measure. You might like to know the number. Last year we sold 167,000 charts of all kinds; we printed 296,000; the remainder mainly went to the service of the fleet; I include those which were torn up.

5080. How many new sheets would you produce in that time?—Last year we produced 70 new plates.

5081. (*Sir A. Geikie.*) Is that a fair average in your production?—No, it is rather larger than usual.

5082. Plates of places not previously surveyed by the Admiralty?—Yes, and re-surveys; we are constantly re-surveying.

Capt. W. J. L.
Wharton,
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19 July 1892.

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I would also just like to express my opinion that I hope that the 6-inch sheets will eventually be engraved. I quite recognise the value of photo-zincographing to get them quickly out, but the difference between the old engraved 6-inch sheets and the photo-zincographic ones is so great that I do not think that the latter should remain as permanent records for all time to come.

5083. Do you make that observation with regard to the Admiralty survey?—No, I am speaking of the Ordnance.

5084. (Chairman.) We have only asked you questions about your charts, but if you would like to make any observations about the Ordnance Survey, we should be very pleased to hear them?—I do not know that I have any more than that, sir. Of course the absence of a periodical re-survey is a very great blot. It must appear to everybody; I need hardly mention that we find the inconvenience of that also when we make a survey of the English coast, we also have to go over the land very carefully to see that everything is in, railways and houses. And also I cannot say that I like the quarter-sheets, either of the 6-inch or the 1-inch survey. They are much more inconvenient to us in taking from them for our work, and as a private individual, I find them also inconvenient if I want to buy a map in a part of the country I go to, which is

The witness withdrew.

Mr. A. R.
Binnie.

Mr. ALEXANDER RICHARDSON BINNIE called in and examined.

5091. (Chairman.) You are engineer to the London County Council?—Yes; I am chief engineer to the London County Council, and a member of the council of the Institution of Civil Engineers, and have for upwards of 30 years been actively engaged in my profession, which has at all times required me constantly to use the maps of the Ordnance Survey.

5092. I had better read the notes of your evidence that you have handed in:—

"A. Speaking generally, the maps above referred to may be divided into two classes, viz.:—(a.) Urban or town surveys; (b.) Maps of smaller scale (down to 1 inch to a mile) of the country generally.

"B. With regard to style of execution, general information, and mode of publication, the engineer thinks that the scale of 25 inches to the mile and 5 feet to the mile, as applied to town areas, are almost all that could be desired, if printed on proper paper from the plates themselves, and not by means of the zincograph.

5093. (Mr. Roby.) What do you mean by proper paper?—As I have mentioned a little further on under the head No. C:—

"C. The engineer ventures to make the above remarks in consequence of having recently had to work from certain photo-zincograph 6-inch scale maps of certain Welsh counties, which, he considers, are produced in a style far below that which should characterise a country like Great Britain and Ireland. The drawing is poor, rough, and even confused; the contour levels, being 100 feet apart, are too wide for any useful purpose, and the paper upon which the maps are printed is of so spongy and soft a description as to render them useless for the purpose of adding any special information that may be desired.

"These defects stand out in broad contrast to the exquisite work of some of the previous surveys in England, Scotland, and Ireland upon the same scale, and are markedly inferior to the maps produced by most continental nations.

"He would, however, suggest that, at any rate as regards London, a 12-inch-to-the-mile scale Ordnance map would be a very great convenience to the public, and much more serviceable than the 6-inch Ordnance sheets for which it might be substituted.

"As to the maps for the country generally, he would draw attention to the 6-inch surveys as being typical of the best work. These maps are particularly valuable in all cases of engineering works, as they give contour lines at every 25 feet up to 1,200 feet above sea level, beyond which altitude such accuracy is not required."

5094. (Lieut. Gen. Cooke.) That is the old 6-inch?—The old 6-inch.

5095. (Chairman.) That only applies to Lancashire and Yorkshire?—Lancashire and Yorkshire. I take these as typical instances of the best work.

the first thing I do. I prefer to have a whole sheet to a quarter-sheet in the first place; you can get a whole sheet for 2s. 6d., and four quarter-sheets for 4s.

5085. Do you know the reason why quarter-sheets are produced?—I know why the quarter sheets are produced. As far as the zincographed sheets are concerned, I understand they must be done so; but in view of engraving them some day or other, I should hope that they will engrave them as whole sheets.

5086. It is inconvenient getting little pieces?—Yes. I do not think I have anything more to say.

5087. (Mr. Primrose.) What sort of time does it take to produce an ordinary engraved copper-plate?—A double elephant sheet about—well, from three to four months.

5088. And what is the cost of the actual engraving?—Well, a sheet that would take three or four months would cost about 50l. Of course plates with a good deal of work on them, would cost 80l. or 90l. and occupy more time.

5089. (Chairman.) I suppose you would say that your engraved sheets have not got so much detail on them as a land sheet?—Oh, no.

5090. A land sheet would take a great deal longer?—Yes, and our work is much more coarsely done.

5096. "The engineer would like to impress upon the Committee the importance of continuing this style of work where it has not yet been carried out."

"D. It might be possible to induce municipal authorities to furnish annually to the Ordnance Survey Department maps on which alterations would be shown. This would, no doubt, be of some assistance to the survey, but could not be absolutely depended upon, as alterations are continually taking place in buildings, &c. after the plans for the same have been sanctioned by the local authorities."

"The engineer would suggest that assistance to the Ordnance Survey would be rendered if local authorities could be induced to furnish the Department annually with the copies of plans of roads and buildings which have been sanctioned by them, and certified under their authority. With the help of these sanctioned plans it would be possible for the Ordnance surveyors to fill in details of new buildings and streets without the necessity for re-surveying the whole area, and at the same time they would be able to detect on the ground any alterations which might have been made in carrying into execution the sanctioned works."

"E. The engineer hardly considers that it would be wise to accept as accurate the filling in of the Ordnance sheets by local authorities, as he fears that the work would be likely to prove 'loose' and 'patchy,' and would very probably lead in the future to some extensive alterations, as additions were made to the maps without that accuracy of work, and strictness respecting general position in regard to trigonometrical stations which are so valuable, and so characteristic of our Ordnance Survey."

"F. As to the periods at which revisions should occur, generally speaking this must depend upon local circumstances."

"(a.) In towns it will of course depend on the growth of the population, ranging from London through active manufacturing centres down to the smaller municipal towns, which principally form the centres for the distribution of agricultural produce."

"In the case of London so rapid is its growth in the suburban districts and so numerous and constant are the reconstructions and rebuildings in the existing portions of the metropolis, that the engineer considers that to carry out the work efficiently an adequate staff should always be engaged on the revision of the survey of London, and should this not be done the work will go on accumulating until, as at the present moment, it will almost involve the re-survey of considerable areas."

"In order to show clearly the time which has elapsed since different districts of London were surveyed he has prepared an index plan showing by various tints the dates at which the surveys were made for the maps now published; these dates vary from 1862 to 1874. During this period of from 18 to

" 30 years which has elapsed since these dates, it is almost needless to point out that large areas then consisting of market gardens and fields have now become covered with streets, and the Ordnance sheets are therefore practically useless. It will also be observed that the large-scale Ordnance sheets do not embrace the whole area within the London County Council boundary.

" He thinks that not only should the whole of this area be shown on the sheets, but that they should be extended so as to include at any rate the whole of Greater London or the combined city and metropolitan police districts."

5097. (*Witness continuing.*) "Within this area outside the county of London is situated the outer ring of the census return the population in which is increasing at the rate of about 50 per cent. in 10 years, which means a very rapid change of the configuration of the district.

" In the larger municipal towns a survey every five or ten years would probably meet the requirements of the case, but in both these alternatives the establishment of new and the checking of old bench marks is an important feature which should not be forgotten, as the continued erection of new buildings and reconstruction of old tends to deface and entirely remove the bench-marks established at the period of the original survey.

" (b.) As to the revision of the 6-inch and 25-inch scale maps in agricultural districts the engineer would point out that in some parts of the country, in great manufacturing or mining centres, the maps would require to be revised about every 10 or 15 years. In purely agricultural districts they might remain practically untouched for much longer periods.

" G. With regard to parish, municipal, and Parliamentary boundaries the engineer considers that these should be shown on the Ordnance maps at as early a date, after they have been altered or any new boundaries have been established, as is compatible with the other requirements of the survey, and should not be left until the revision of other detail is undertaken.

" H. The engineer would remark that much could be done to improve the 1-inch survey of the country. Parish boundaries and the boundaries of other divisions could with advantage be shown as in the case of the 1-inch survey of Ireland, and it would add greatly to their usefulness if contour lines indicating differences of level of 50 or 100 feet (according to the steepness of the ground) could in all cases be introduced as has been done in the case of some sheets of the Scotch survey.

" There are also two points of detail to which the engineer wishes to draw attention, one is the desirability of having all bench-marks in London and in other urban districts given to two places of decimals; the other is that the levels of bench-marks given on the latest issue of the Ordnance Survey detail sheets of London are in many cases not as accurate as they should be, and require careful revision." P—My staff have found errors amounting to two-tenths or three-tenths of a foot recently on some of the later sheets.

5098. You are satisfied that these are errors?—I think so; they have given us a great deal of trouble in checking them, and we have found that whilst some bench-marks are perfectly accurate, intervening bench-marks are inaccurate to the extent of two-tenths or three-tenths of a foot.

5099. I think it would be very desirable if you could specify those places?—I should be very happy to send the list that we have discovered.

" It would also be of very great advantage if more care could be given to the question of printing the maps on paper which would reduce shrinkage to a minimum and would not shrink unequally. At present great difficulty arises from this when several sheets are joined together; it often happens from this cause that the value of a map is practically destroyed."

5100. Then the map of London as it now exists, the 5-foot map, was engraved between 1868 and 1872, so that it is getting rather old; apparently you have turned your attention, Mr. Binnie, to the possibility of these maps being kept in order by the local authority supplying to the Ordnance Office tracings every year of alterations?—That is to say, the local authorities pass plans of buildings and plans of new streets, and I think, it would be of great assistance if they could be

induced—I do not know in what way—to furnish to the Ordnance Office plans of all those new buildings.

5101. Now do you think there would be any objection to the obligation being put upon them by statute to supply tracings of all the alterations that received their sanction, on the scale of the Ordnance map, to the Ordnance Survey Office free every year?—I do not think so, sir, I think it would be a very reasonable requirement.

5102. And where there was a good staff of surveyors, the plans would be fairly trustworthy?—They would be fairly trustworthy as far as they go. I should not, as I have already mentioned, like the Ordnance Survey to depend upon the filling in on the Ordnance sheets of those sanctions for this reason: the local authorities sanction a plan of a road or a row of houses, those are very often varied in the construction by the local authorities themselves, I myself at Spring Gardens have continually discovered, after our plan has been sanctioned, that the builders or the local authorities vary the actual sanctioned plan, so that it would not be sufficient if we at Spring Gardens filled in an Ordnance sheet with our sanctions; but those sanctions which we could give you would be very valuable, I think, and would avoid a great deal of detailed survey. The Ordnance surveyors, in transferring those to the sheets, would merely detect on the ground the inevitable alterations that had been made from the sanction.

5103. The course that would be taken, I suppose, would be this: that the Ordnance, having got a batch of alterations referring to certain sheets, would send a surveyor up to London, probably would ask you or one of your staff to meet them, and would test these drawings on the ground?—On the ground; that is it.

5104. And do you think that would save them much trouble?—I do; I think it would save a great deal of detailed work which takes the greater part of the time in surveying town areas.

5105. It saves three-fourths of that time perhaps?—Oh, I should say so, fully.

5106. It also would save them hunting about for the alterations?—It would, undoubtedly.

5107. Now, that being done, you would not suggest, I suppose, that they should publish them at once; that would be impracticable?—That would be impracticable, publishing at once, it would have to be published from time to time as the exigencies of the Department would allow.

5108. You would probably suggest that upon requisition and payment they should supply a correct plan re-drawn?—I think so.

5109. In manuscript?—That would be a reasonable return for the obligation under which you place the municipal body. Something—not exactly of a similar nature, but I should like to bring it before the notice of this Committee—occurred at the general institution of the Ordnance Survey. I would place the minutes of the Metropolitan Boards of Works before you in which the Metropolitan Board of Works contributed the sum of 10,000*l.* towards the London survey; so that the Council do feel that they have some slight claim on the Survey for keeping it up to date.

5110. Yes; in 1859 the Metropolitan Board of Works stated:—"With the view of facilitating an arrangement between the Treasury and this Board for compensating the claim of the War Department for the survey of the metropolis, the Board are prepared to offer 10,000*l.* payable out of the main drainage rate, the War Department retaining the plates and copy-right, but agreeing from time to time to supply the Metropolitan Board of Works, the Commissioners of Sewers for the City of London, and the several vestries and district boards of the metropolis with as many copies as may be needed for practical purposes at the rate of 1*s.* per sheet."

5111. So that at the present time you have a special rate for the supply of maps?—No; we purchase them as the public do; we get them on no terms other than that; we obtain them.

5112. (*Lieut.-Gen. Cook.*) And that does not hold good now?—Not exactly, sir; no, that is a matter past; but still the County Council feel that they have some slight claim on the War Department to keep the survey up to date.

5113. (*Chairman.*) Are you of opinion that it is a proper thing that the State at its expense should maintain the town plans?—I think so; I do not know any-

Mr. A. R. Binnie.

19 July 1892.

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one who can do it so well, who in fact can do it in that style in which it ought to be done.

5114. You would not think it a fit thing that although the Ordnance supply it, it should be made a charge on the locality?—Hardly, I think.

5115. Supposing that the State supplies at its cost the 25-inch, the 6-inch, and the 1-inch plan, has it not done all that is required in the public interest as apart from the interest of the particular locality?—I think so; assuming that they are kept up to date.

5116. But that the town maps are essentially required for the town purposes, not for public purposes as distinct from the interest of the locality?—Well, that would be difficult to say; in some cases undoubtedly the way you are putting it would be the case. In the metropolis I think it is a sufficiently important subject to be a national subject, really.

5117. I am looking at the matter not only from the point of view of the metropolis, but from the point of view of all the large towns?—Yes.

5118. These maps are mainly required for administrative purposes for the towns?—They are.

5119. And in fact you could not carry on your business as engineer for the London County Council unless you had such a map?—Certainly not; that is perfectly clear.

5120. If it were not produced by the Ordnance Department you would have to produce it for yourselves in some way?—Undoubtedly.

5121. And at the present rate of supply it is very cheap?—Oh, very cheap; it is much cheaper than we could do it.

5122. Than you could produce it?—Yes.

5123. Up to the present time there is an undertaking on the part of the State to map all the large towns either on the 5-feet or the 10-feet scale?—There is; yes.

5124. Supposing it was now thought that rather too much has been given to the urban authorities under that promise, do you think it would be fair or legitimate now to say that all future revision should be carried out at the local charge by the Ordnance Survey Department?—I hardly think it would be accepted among the local authorities.

5125. You are aware that the local authorities are obtaining large sums of money from the Imperial exchequer which they did not receive a few years ago for technical education, and so on?—Oh, undoubtedly.

5126. Might not the State, then, in consideration of that, require a little contribution from the local authorities?—I think so; I have already said that in the case of London the principle has been admitted; they have already contributed, as I notice, 10,000*l*.

5127. (Mr. Roby.) Many other towns, I think, have done the same?—I am not aware, but possibly they have; it is a reasonable thing.

5128. (Chairman.) You say it is a very reasonable thing that they should contribute towards the cost?—It is.

5129. In the preparation of the 25-inch map and the 6-inch map the whole of the work done upon the 5-feet or 10-feet is available for it?—Oh, of course.

5130. And further it materially reduces the cost of them?—It does.

5131. Therefore, if that is intended to be produced solely at the cost of the nation, a part of the cost of the 5-feet or 10-feet map may very fairly be borne as part of the cost of the other map?—Yes, it would, sir.

5132. Now, your map of London is an engraved map?—It is.

5133. And a very beautiful map?—It is very beautiful.

5134. Over what area does it extend?—The boundary of the county of London is shown by the green line on the diagram I produce, and as far as I am aware the large-scale plans only extend over these areas, and does not embrace even the whole of the county.

5135. (Mr. Roby.) But you would not expect the 5-feet to cover the whole of the western parts of Middlesex, would you?—It ought to do, to complete up to the county boundary, at least.

5136. It is not done at all?—Oh, no, not as far as Uxbridge.

5137. That is county, you know?—I am speaking of the administrative county of London.

5138. (Chairman.) You would ask that the 5-feet map should be not only revised, but be extended to the area of the County Council?—Yes.

5139. Do you know whether the outlying townships, "Barnes, Richmond, and Mortlake," have any other map but the 25-inch map?—The 25-inch map and the 6-inch map they have.

5140. I mean a larger scale?—I believe they have the 25-inch parish map, which was published.

5141. But they have not got a town map?—Not a town map.

5142. Nobody has got a town map?—Nobody has got a town map, I think.

5143. I think you said you wanted not only an area of the administrative county of London, but the area of the police district surveyed on the 5-feet?—Well, something, I will not bind myself exactly on what scale, it ought to be a large scale, sir. I would ask you to consider the fact that the houses in that outer district are increasing at the rate of 48,600 to 84,200 every ten years, and the population is increasing at the rate of 50 per cent. every 10 years. In that outer district the facts of the recent census may be taken as this, that the County Council area is nearly occupied, and the surplus population is overflowing into that outer ring between the black area and the brown area on that little map that I have shown you.

5144. You suggest here that you want an intermediate map between 25-inch and the 6-inch?—That is the suggestion that I make, sir.

5145. Why is that?—For this reason: the 6-inch map is almost too small for London work for a densely built-upon area, and a 12-inch would be much more useful.

5146. But does not the 25-inch map come in there?—That again is rather large.

5147. (Mr. Roby.) What kind of work are you thinking of when you are wishing for a 12-inch map?—Well, I should say, intermediate, between the 25 and the 6.

5148. Yes, but for what kind of work, what kind of purpose?—I mean for general town purposes.

5149. For laying out sewers?—For laying out sewers and for new streets, and for the various purposes for which we use such a map.

5150. Now you use the 6-inch map?—We are driven from the 6 to the 25.

5151. (Chairman.) The 25 is not too large for laying out sewage works on?—Oh, not at all, sir; but when you come to exhibit a district before a committee, we find that the 25-inch is amply sufficient for showing the detail, but if you want to show it in connexion with anything else, the surrounding district, it makes a very large map indeed, and runs us into a lot of expense, and then if we put it on the 6-inch map, and hang it on the wall, the gentlemen on the committee concerned, cannot see exactly what it is across a room.

5152. (Lieut.-Gen. Cooke.) Have you had occasion to make many 12-inch maps for yourself finding the 6-inch insufficient?—I have had to reduce the 25-inch to many scales for the special purpose that I am now speaking of.

5153. Mostly to the 12-inch?—Mostly to the 12-inch and to 18-inch scales; various arbitrary scales I have had to make many maps for.

5154. (Chairman.) You object to the new 6-inch maps that the contour lines are too wide apart?—I do, sir, very strongly.

5155. Have you used the old 6-inch map where they were 25 feet apart?—For very many years.

5156. You have not got them for London?—We have not got them for London.

5157. You have got the 100-feet contour lines there?—The 100-feet contour lines.

5158. You think they are insufficient?—My remarks applies specially to what I learned last autumn. Of course you are aware that the County Council are moving in the direction of water, and I had to go over the greater part of South and Mid Wales, the counties of Brecon and Radnor, and I was exceedingly sorry to see what I can only call the falling off in the very beautiful work of the Ordnance Survey on the maps; and really for engineering purposes the contours might

almost be left out, and especially when you got into hilly ground.

5159. You mean as not being sufficient?—Not sufficient, and the style in which it is prepared is beneath what it ought to be for a country like England.

5160. With these contour lines you can find places where the pickets were, I think?—Yes, you can.

5161. From the zincograph map?—From the zincograph map.

5162. Now, as an engineer, is it not practicable, in going over a country for the purpose for which you were going over it, without much difficulty to interpolate contour lines for yourself, considering the numerous surface levels and bench-marks which are on the map?—Hardly so when you get into a county intermediate between a flat county like Middlesex and a steep country like Wales, the 100-feet contours are really so far apart that, walking over the ground, you cannot see from one 100-feet to another, it is exceedingly difficult.

5163. In Wales you could see?—In Wales you could. I am speaking now of a flat country.

5164. You are aware that the introduction of contours is a very expensive process?—Undoubtedly.

5165. But you think it would be worth the expense?—Well worth the expense; in fact one of the values of the Ordnance map is the contour lines, looking at it from an engineering point of view.

5166. Contouring costs about 17s. a mile?—Yes.

5167. Which of course would mean an enormous expense?—It would undoubtedly.

5168. 17s. per mile, not square mile, contoured?—Oh, no; I quite understand.

5169. Do you think it would answer the purpose instead of putting the contour lines at regular altitudes to say that there should be a contour line at every quarter of a mile?—That in the intermediate country I was trying to describe a few moments ago would undoubtedly meet the case; when you come into a mountainous country or semi-mountainous country that would hardly do, because that would put them further apart than they are now at the 100-feet.

5170. You might say not less than 100-feet vertically and at a quarter of a mile horizontally?—I would hardly like to say so, because I would like to see them kept very much nearer; even in that hilly district there it becomes of great importance to have them as near together as you possibly can get them.

5171. Although you say that the work on the 6-inch map is coarse, it is practically effective?—Oh, I have no doubt about its accuracy; but it is coarse in the sense that when you come to measure from fence to fence the lines are so rough that you inevitably make errors if you are not exceedingly careful. Of course it goes without saying it stands out in marked contrast to the beautiful engraved sheets of the former surveys.

5172. I think we need not go into the question of paper?—No, we all know in making the maps that is a great bone of contention; it is very difficult.

5173. What sort of paper do you like for maps?—The ordinary double-elephant size on which the surveys of Lancashire and Yorkshire, Scotland, and many other parts are published already.

5174. (*Mr. Roby.*) Double-elephant, I think merely refers to the size of the sheet; it does not describe the thickness?—No, it does not, sir.

5175. I was thinking about the thickness; would that kind of paper be of any service (*map on thin paper exhibited to witness*)?—No.

5176. Not thick enough for your purpose?—Oh, not at all.

5177. Do you not mount your maps?—We do, after the work has been put upon them.

5178. But that would not stand the work that you put upon them?—No.

5179. (*Chairman.*) You like thick drawing paper?—Thick drawing paper.

5180. In the 25-inch map and in the 6-inch map there is a very large amount of detail such as hedgerow timber and particular trees, actually surveyed trees, all over the map, and a good deal of other small detail. Are you in favour of that, or would you omit any of it?—It looks very elegant on the map; I do not think it is of any great utility to anyone.

5181. Is it in the way?—It is not in the way, except that when you come to work on the sheet it gives a dark tint to the paper.

5182. (*Mr. Roby.*) You would just as soon be without it?—I would just as soon be without it.

5183. (*Lieut.-Gen. Cooke.*) When trees are shown in villages and you have to deal with houses in villages the trees interrupt a good deal?—They do; they cause a little confusion on built-on areas. Where there are woods and copses I think they should be indicated on the plan, but the details of it should not be allowed; it is a matter of great indifference, in fact I would prefer them away personally.

5184. (*Chairman.*) You would prefer them away?—Yes.

5185. Perhaps you are aware that the Institute of Surveyors were of opinion that hedgerow timber should be altogether omitted?—I should not be surprised that they should be.

5186. In your 5-feet map any little patches, any little gardens, are shown, and every tree, and every lamp-post, and every gully-hole, I believe?—Yes.

5187. Do you think that that should be always shown?—Lamps and gully-holes are of advantage, but the details of gardens are quite thrown away—quite.

5188. In the production of any new large-scale town maps would it not be almost as well to leave the local authority to put in their gully-holes and their lamp-posts, because they are all of them shifting things?—They are, sir.

5189. It increases the need for revision very much? It does; from that point of view it might be of advantage to leave them out, although when the survey is being made I do not think it takes very much greater trouble to insert a few matters of that kind and very often they are useful.

5190. (*Lieut.-Gen. Cooke.*) You would have to insert them yourself if they were not inserted, I suppose?—Oh, yes.

5191. (*Chairman.*) I was rather looking at the question of revision, it is the taking of them out again?—I understand, sir.

5192. You see your map is incorrect immediately a lamp is removed?—Yes.

5193. If you put in a lamp-post yourself, you would strike it out of your copy if it were removed, and it would not appear in any other map, because it would not be published?—Yes, you are perfectly correct there.

5194. In making town maps would it not be better to leave out these details?—Oh, from that point of view it would be of advantage and leave the local authorities to put them on themselves.

5195. The town map, I do not know whether your London town map is published in two forms, coloured and uncoloured; is it?—I have never seen it coloured.

5196. You have only got the engraved?—We have only got the engraved, I have never seen coloured copies published.

5197. Have you had anything to do with the large town maps of other towns?—Of Bradford particularly, partly of Manchester.

5198. You are aware then that these maps are published either as skeletons or as coloured maps?—Yes, I have seen them.

5199. But when they are sold as coloured maps they are very expensive?—They are.

5200. Do you think it would be desirable to abandon colour and abandon the skeleton and substitute hatching or cross-ruling, as you see on that map behind you? The cross-lining is far better.

5201. You would publish them in that one form, cross-lined?—Oh, certainly.

5202. (*Lieut.-Gen. Cooke.*) Do you not find it an objection when you have to make alterations of town maps that the hatching causes a good deal of unnecessary erasure?—It does undoubtedly cause a certain amount of erasure, but I prefer that; it is not so confusing as the colour, because we often have to use town maps and we have to colour them ourselves to express certain local facts connected with a special report we are making. Well, when you come to work on a map that has got a red colour on it, it becomes confused.

Mr. A. R. Binnie.

19 July 1892.

Mr. A. R.
Binnie.

19 July 1892.

5203. But you must remember you can get that map uncoloured; you cannot get the hatched maps un-hatched; you must bear that in mind?—Yes.

5204. (*Mr. Roby.*) But a map without hatching is rather confusing for your purpose?—It is.

5205. You do not know exactly where the buildings are?—Yes.

5206. (*Chairman.*) You would like to have only one form of map, black hatching?—Yes, black hatching.

5207. And that would put an end to the extravagant price of the coloured map?—I am not aware of the cost of the coloured map.

5208. It runs up to 11s. 6d. for a town plan?—I understand it must be dear.

5209. They are hand-coloured?—Hand-coloured.

5210. Have you paid any attention to the present method of numbering and showing areas on the 25-inch map?—I have not particularly; I have noticed them, but I have not paid any particular attention to them.

5211. You have no number or any form of index for the town maps?—Further than the index of the map published by the Survey itself.

5212. But I mean you have no index to particular properties; houses are not numbered?—Oh, no, they are not; I do not think it is necessary.

5213. If it is not necessary in a town, is it necessary in the country?—For rating purposes in the country I believe it is an advantage on the 25-inch.

5214. Do you know any case in the country where the 25-inch is used for rating purposes?—I do not know, but I imagine it would be useful for the purpose. As engineers, one of the first things we do when preparing the 25-inch map for parliamentary deposit is to cross out all the numbers.

5215. You get rid of them?—We get rid of them, because they interfere with the reference numbers we have to put by standing orders on the map.

5216. For this purpose you would rather be without the numbers?—We would rather be without the numbers.

5217. If the numbers were of no use for any distinct purposes, you would prefer the map without them?—I would.

5218. You do not object to the areas being stamped?—I do not think they would be any disadvantage.

5219. They might be useful to you?—They might be useful stamped in some very unobtrusive light kind of type.

5220. You are aware that on some maps there is an area book published. In the more recently published books the area books have been abandoned, and the areas put on plan?—Yes.

5221. Which do you think is the best plan?—Putting the areas on the plan.

5222. With regard to the period of revision, would you say a town plan of London ought to be republished every five years?—I think so; I think certainly not at a greater interval than five years. Things move so rapidly in London.

5223. With regard to the 1-inch map, you say you think that the parish boundaries and boundaries of other divisions could with advantage be shown on the map?—That is partly done already.

5224. Do you not think that that rather confuses the map for general purposes?—I do not think so; I think it is done with considerable skill on some of these maps so as not to be confusing.

5225. The old Ordnance map was published in two forms, one called the index to the tithe map, which shows parish boundaries, and the other without such boundaries?—It was so.

5226. Do you think the public would have been equally satisfied if only that form of map should have been published which was called the index to the tithe survey?—I think it would, quite.

The witness withdrew.

5227. You do not think the parish boundaries there are any detriment to the map as a map?—No; I may say for myself that when I order the 1-inch map, I always ask for the index copy with the parish boundaries shown upon it.

5228. The parish boundaries are shown there (*new photo-zincograph map shown to witness*)?—So I notice.

5229. That is the new engraved map, and that is the photo-zincograph map. They are all going to be like that?—Nothing could be better, of course, than that.

5230. You are quite satisfied with the new engraved 1-inch map?—Oh, certainly.

5231. What do you say to that?—That is a very good map.

5232. The photo-zincograph map is a very good map?—Oh, a very good map.

5233. Would you be satisfied with it as a national production?—No.

5234. You think that it ought to be now completed?—I think the engraved map ought to be completed.

5235. And you are not in favour of omitting parish boundaries from the 1-inch map having them only on one edition?—Oh, no; I would rather leave the other edition out altogether.

5236. With regard to the hill-shading, have you given any attention to the methods of producing hills?—I think a good deal the best map I have ever seen produced by the Survey is a map of a part of Haddington or Mid-Lothian; it is beautifully hill-shaded and showing contours at the same time. I do not know whether you know the sheets.

5237. They show contours?—Yes, but the hill-shading was made the means of showing the contours—in the neighbourhood of Edinburgh, I forget which county it is.

5238. (*Lieut.-Gen. Cooke.*) You mean a flat shade between the contours?—There was a little blot in the hill-shading which indicated the contour line, and it had a very good effect; it was pleasing to the eye and gave a very good idea of the country.

5239. (*Chairman.*) Would you like the hills produced in that form better than in the black?—Well, I think in this particular case it certainly looks better, but it would be a very expensive process, I expect.

5240. It would involve separate printing?—It would involve separate printing.

5241. When you get to very mountainous ground the tendency of the black shading is to make the map too black?—It is.

5242. And you cannot read it?—Yes.

5243. In an elevation of about 600 feet like this it does?—Oh, yes, it does very well.

5244. You would not be prepared to advise any change from the black to colour?—I think not. I think the black is good enough for the 1-inch map, and although the colour is better it would be more expensive.

5245. You would prefer that?—Personally, I would prefer that, if the expense could be got over, but I think this for the 1-inch map is all that is required.

5246. Do you think you could ever get from that brown as artistic a map, or that you would ever get the same effect?—No, it is only when you come to examine it minutely.

5247. As an artistic map you would not get the same effect from the brown as from the black?—No, not so minutely, but looking at this whether the map is a hand map or a wall map—

5248. As a wall map?—As a wall map I think the black would show best.

5249. Have you any desire for maps printed in colours?—No, we have to do with maps printed in colours when we come to the Geological Survey.

5250. Is there anything else you would like to add?—I think not; but I shall be happy to afford any further information in my power which the Committee may desire.

Professor J. H. MERIVALE called in and examined.

Prof. J. H.
Merivale.

5251. (*Chairman.*) You are a mining engineer?—Yes.

5252. And practice in what county?—Northumberland and Durham, and I was also in practice in Cumberland, but I am not at present.

5253. You are conversant with coal mines and metal mines?—I am conversant with coal mines and have a little knowledge of metal mines.

5254. Will you read your notes?—The 6-inch map, more especially when geologically coloured is used as

a "royalty map," i.e., the properties of the various mineral owners are coloured round, and the names put upon them. In this way the owners, boundaries, and often the areas of the various properties over a considerable extent of country can be seen at a glance.

Tracings for leases, for the illustration of letters, and for all questions not involving much detail are conveniently and are continually taken off this map.

As an illustration of the use of this map I may say that only last week I had four sets of three tracings each taken off a mining take of 5,010 acres, No. 1 showing the surface and the positions of important points as shafts, workshops, cottages, &c. No. 2 the main drifts in one seam, No. 3 the main drifts in another seam.

Mining engineers doing business as lessors' agents use this map largely. I have over 100 sheets.

The 25-inch is used as a working plan. The sheets are cut, fastened together, and mounted upon cloth. The workings are then laid down from day to day upon the maps; in this way an accurate plan is obtained at a small cost, and the relative positions of the workings, and surface erections, &c., &c., a matter of much importance, are seen at a glance.

In some cases to avoid the (for this purpose) unnecessary surface detail a plan is made from the Ordnance, omitting some of the details—trees, for example. This is of course much less costly than making a special survey; but it would be convenient if a map could be published on this scale, without details, say, with fences, roads, water, houses, and railways only.

The details we want are the portions of things that might be damaged by the workings; such as churches, houses, and railroads, and also the positions of things that might damage the workings, such as rivers, and streams, which we might let into them.

5255. (Mr. Boby.) All buildings and water?—All buildings and water, main roads, and railways.

5256. (Chairman.) And not fences?—Perhaps it is better to have fences; a plain line only.

5257. Practically all you want omitted is the trees?—It practically comes to that. The trees obscure, and you cannot see the lines representing workings.

5258. (Mr. Boby.) Where it is merely a wood or a copse?—I think we are better without it.

As to scales, a map upon a scale of two chains to the inch would, no doubt, be convenient in some cases.

5259. (Chairman.) That is 4 feet?—That is 44 yards to the inch.

5260. It is 40 inches to a mile?—About that.

Possibly if the survey were now beginning there might be a better relation between the scales; but the general opinion appears to be that the 6-inch and 25-inch scales suit all the reasonable requirements of mining engineers in the north of England, and I am certainly of this opinion. Personally I do not think a 2-chain scale is required, but some of my friends in the north seem to think so. I think that the present scale is all we want. Then as to suggestions. The centres of shafts and boreholes should be shown. They are, more especially the first, the starting points of all mining surveys. Our shafts have almost always the engine house concealing the top, you show the engine-house and not the shaft. What we really want is the centre of the shaft; we do not care so much about the engine-house.

5261. You have not brought a map with you?—No. (Map exhibited to witness.) The shaft is shown there, but our shafts are as a rule covered by an engine-house, and you show the engine-house, which no doubt is the surface feature, and not the shaft; the shaft is simply a hole, you show the surface feature, the engine-house; but what we want is the centre of the shaft; it merely means a black dot somewhere. In nine cases out of ten the engine-house is shown and not the centre of the shaft. We do not require so much information as other people, because we are all surveyors and we can measure for ourselves. That is my own view. If we are going to do anything of any importance we can measure, but what we require the Ordnance map for is this, something is passing through our mind with reference to some alteration we would like to make, and we cannot go out, it may be, 20 miles away and measure; but we take up your Ordnance map, and with that Ordnance map we are able to correct our views with reference to the thing we have in hand, and that is really what we use the maps for. For anything special we make a special survey.

5262. Do you know Mr. George Lewis?—I know him by name; I do not know him personally.

5263. Do you know that he has been examined here?—I knew that he was going to be. I did not know that he had been.

5264. He gave very strong evidence about the 40 inches to a mile; that is the two chains to an inch, and he produced his 25-inch map, showing the workings laid out on the surface, and what the workings were underneath, and he complained that it was not large enough. A question was asked him: "As a mining engineer the 25-inch map is of no use to you?"—He replied, "Very little indeed. Of course, by the Mines Inspection Act of 1887, which was the last one passed, we were allowed to make the surveys and to show the workings of the mine upon the 25-inch map. We were exceedingly anxious at that time that the Government map should be provided for the purpose, or that the Government map should be accepted as sufficiently large for the purpose, and we asked permission that the 25-inch scale might be used. You must understand that the object of making plans of these workings is not only to show where the workings themselves are, but we have every half-year to make out calculations to show that the areas are correctly worked during the half-year, and these plans show the workings from half-year to half-year." He then produced the map.

Then he was asked this question: "Is this map of insufficient scale to enable you to show where you have got to?"—He replied, "We find in practice, extending over a considerable number of years, that the generally-accepted scale is 2 chains. This is too small for the purposes of working. The whole of these roads are surveyed underground by theodolite, but there is a great deal of very careful work, and a great deal of care is obliged to be exercised, and we have found this too small a scale." The 25-inch is too small for the purposes of the workings. You do not then agree with him; you say the 25-inch map is big enough?—You must remember that their system in the south is different from ours. Our rents are assessed upon the ton, their rents are assessed upon the acre. We never have to do what they have to do, therefore I am not in a position to give an opinion. Personally, I am quite content; my own plans are on that scale, 2 chains to the inch. I am perfectly content with them, and I have never come across a colleague in the north who said that the 25-inch was too small; there is only one gentleman who has said to me that 2 chains to the inch would be better.

5265. (Lieut.-Gen. Cooke.) Are the maps that you have to deposit on that scale?—Whatever your scale may be you deposit maps on that scale; you are not tied; the Act says your plans must be on a scale of not less than 25 inches, or on the same scale as the plan for the time being in use in the mine.

5266. But do you practically deposit these maps on the 25-inch scale?—The only maps I deposited were on the 2 chains to the inch, but I would deposit on the 25-inch scale and there is no question but what they would be accepted; 4 chains to the inch is not an uncommon scale in many collieries. In one of the largest collieries with which I am acquainted at Durham the plans are all kept upon 4 chains to the inch; that is half the size of the 2 chains.

5267. (Chairman.) I suppose you find the map is quite adequate?—I have never myself, and I think inaccurate speaking of the 25-inch. So far as I know, I have never found any fault of that kind. You must remember that where we use the 25-inch, we use a very small person, the 4 chains 5,000 or 6,000 acres, in which we happen to be interested, if there is something that we want that is not there, we should put it upon the plan, and we should not think it a hardship to have to do so.

5268. You never applied, I suppose, to the Ordnance Survey Department to give you a map, something like details that you object to?—No.

5269. I should think it quite possible for them to produce you a special edition?—Yes; you know I am simply, with reference to this detail, quoting what I believe to be the general feeling in the north, and personally, I do not think that those details would bother me; but then in my particular district there is not much wood, and I can quite understand in a thicker wooded district that those trees would be a nuisance.

Prof. J. H. Merivale.

19 July 1892.

Prof. J. H.
Merivale.

19 July 1892.

5270. I suppose there is very little demand for these maps, you do not use the map up; the map goes on for years?—It goes on for many years; but we make new plans occasionally.

5271. It would be no use your having an edition of 25 sheets?—A fresh edition, you mean.

5272. If you wanted a map produced for you without this detail, and you were to ask the Ordnance to produce you 25 copies on a certain scale, they would, no doubt, do it?—We only want one.

5273. The question is, whether you would pay for the 25?—I should only require one copy, and it would probably be cheaper for me to make a plan.

5274. To trace a plan?—Not to trace it, but to take an Ordnance map and from it to produce a map omitting the details, that would be done in my own office in the ordinary day's work.

5275. So that the details are not any serious difficulty?—No, I do not think they are, and I think the 6-inch map is of more importance to mining engineers.

5276. And that is sufficient for your leases and your royalties?—Well, all that we want is more contour lines; it is very deficient in that respect; contour lines 100 feet apart are not enough for us, 25 feet is my own view; but I am inclined to think that the majority of engineers in the north would be satisfied with 50. That is a point we have discussed.

5277. You want an increased number of contours?—Yes.

5278. (*Mr. Roby.*) How far would you carry your 25-foot contours; up to 500?—We want it up to the top; if you are working a district with coal, you want the contour lines to be continued over the whole area where there is coal. As a matter of fact these very hilly districts, at any rate in the north, do not contain coal.

5279. There is no coal under the Cheviots?—No, quite so; we have no coal, I should think, above perhaps 1,000 feet; I could not say exactly, but I do not think there is any above 1,000 feet.

5280. The contour lines run up to 1,000 feet now?—Yes, 100 feet apart.

5281. (*Lieut.-Gen. Cooke.*) Would interpolated contours be sufficient; supposing you had 100-foot instrumental contours, would it be sufficient to interpolate contours with the water level?—Would that be within 6 inches?

5282. Would you want it within 6 inches?—Well, I think a foot would be quite accurate enough.

5283. (*Chairman.*) Any system of interpolated contours which came within a foot would be accurate enough?—I think so, but of course in the mining districts the contour lines are altering perpetually. I am altering the contour lines in my own district to very much more than a foot. I have run a series of levels over the ground to show what the sinkage is.

5284. So that in mineral districts the contour lines would want constantly revising?—Yes, they would.

5285. (*Lieut.-Gen. Cooke.*) Then is yours a system of pillars?—We work both board and pillar, and also long-wall.

5286. Which sinks most?—Well, the board and pillar breaks the land up more; in the case of long-wall everything goes down together fairly level; with board and pillar you get big pitfalls, which is much more destructive of the land.

5287. (*Mr. Roby.*) How with regard to the buildings?—We do not work under buildings. We leave the coal solid under buildings, or take out a portion of the coal only.

5288. (*Chairman.*) Do you make any use of the 1-inch map?—I use it as a tourist, but not for mining purposes; we do not use it for mining purposes at all.

5289. Are you satisfied with the 1-inch map?—I am satisfied with the contoured maps. I do not like the shaded maps, because you cannot see the names; and in some cases it is a long way back. In Devonshire, which is my native district, the maps, I think, are very old.

5290. And very bad, are they not, for Devonshire?—I would not like to say very bad, but they are incorrect simply because they are old.

5291. Is not Dartmoor very uncertain in its geography?—I do not know. I have never examined the map very carefully so far as Dartmoor is concerned.

5292. The inhabited parts are fairly right?—There are many new roads in the district I know close to Exeter; there are new roads which are not on the map.

5293. Have you seen the new map of the Exeter district?—No, I have not seen it.

5294. The new maps will all be out this year. What is the date of your map in Northumberland—the 1-inch?—I do not know.

5295. Is that a good map?—I think so, except in the neighbourhood of towns, but I am quite satisfied with it; for the district outside the towns I think it is quite accurate.

5296. And you would suggest that there should be no hill-shading?—I would not say that; I am simply saying, as far as I am personally concerned, if you could put the contour lines 25 or 50 feet apart, I should prefer such a map to the shaded map.

5297. Do you like that map on the wall there?—As a picture I do, not as a map.

5298. Do you know the Cambridge map?—I know the Cambridge map; a hill-shaded map is a prettier picture; but I think for practical use the map with the contour lines is more useful.

5299. Do you think this more useful for the general public?—I cannot speak for the general public; the untrained eye no doubt prefers it, in fact, I believe some scientific people prefer the shaded map too, but I do not, certainly.

5300. Is it rather a matter of taste?—It is a matter of taste, but there is this practical objection, that it obliterates the names; frequently you cannot see the names.

5301. Supposing the hills were printed in brown?—I have no idea what effect that would have. I should have to see it.

5302. Would you look at that map?—The different shades of brown to red, I do not like that at all.

5303. You like the black better (*being shown two maps, one with hill shading in black and another in brown*)?—I prefer the black, but I prefer contour lines to both.

5304. (*Mr. Roby.*) Could you make out a map simply containing contour lines where the hills are not very high; could you make it out very easily?—I think so, I have never experienced any difficulty.

5305. (*Chairman.*) In the contour maps would you like the contour printed in colour?—I think they are very satisfactory in dotted lines, if only distinct.

5306. You never would confuse the geography?—No. Do you know the Belgium map of 1,20,000 and the 1/40,000, with contour lines, five metres apart?

5307. That would be 15 feet?—Yes, they are about that; they are so very strongly marked that in hilly districts they obscure the geography, the 1/20,000 is not so bad, but the 1/40,000 is very obscure.

5308. (*Mr. Roby.*) Are you at all in favour of thin paper?—I should say that thin paper would be best for mounting, and carrying in the pocket; it would not be so heavy; but for mining purposes we want a thick paper.

5309. Where you have to work on it?—I think the thick paper is better, yes. There are one or two other suggestions that I have here, and one is that an index to the signs would be a great convenience if you can print it.

5310. On the map?—On the map.

5311. (*Chairman.*) On the margin?—Yes.

5312. That has been submitted to us before. With regard to the characteristics of roads, do you think they are well represented?—The character of them, yes, I think so. I should like to see the 1-inch map coloured. I think it would be a pretty map and a useful map.

5313. (*Mr. Roby.*) Coloured, in what way?—The roads coloured and the rivers coloured, I am not speaking now as an engineer; but it would be a nice, pretty map.

5314. (*Lieut.-Gen. Cooke.*) You mean printed?—The water shown blue and the woods shown green and so on; it would make a pretty, popular map.

*Prof. J. H.
Merivale.*

19 July 1892.

5315. (*Chairman.*) You think there would be a sale of that map?—Yes, I think so.

5316. In preference to the black one?—I think so; a tourist would prefer to have it.

5317. (*Mr. Roby.*) But you would not like it coloured?—I should not object if well done.

5318. (*Chairman.*) Do you know Bartholomew's maps in Scotland; they are coloured in contours, flaring colours, changing every 100 feet, coloured between the contours from one contour to another?—I do not know them. The only thing of that kind that I have seen is the map of England, showing the height of the hills by colouring, but that is on a very small scale.

5319. That is the French map?—That has a very cheap look about it.

5320. That is not a map to be imitated?—I should like the colours, but it has a sort of cheap look about it; I dare say it is very correct.

5321. There is the new engraved map—a specimen with hills?—Yes, that is very pretty, as a picture, certainly. A contoured map is more difficult to read, but it tells you absolutely where you are.

5322. Have you any other observations to make to us, Mr. Merivale?—Some of our mining engineers complain of the 25-inch not having been published for Yorkshire, that of course you have heard before.

5323. That is for the south of Yorkshire?—In the Cleveland district, Mr. A. L. Stevenson, Sir Lowthian Bell's engineer, writes:—"We have much wanted the 3-chain scale for mine plans, but we have to do without them. All the plans are now made by private survey, and no more are likely to be wanted; but we have suffered greatly. On one side of the Tees they have been out for 20 years, on the other side we are still left in the cold." Then with reference to keeping the maps up to date, it has been asked if it would not be possible to have a local agent in every large town; and if surveyors could not be compelled by law under a penalty to send alterations to this agent who could then keep a stock of 6-inch maps up to date.

5324. You think it would be practicable by law to compel all surveyors of local bodies to send plans to the Ordnance Survey of all alterations they know of?—Yes, quite so.

5325. (*Mr. Roby.*) You are thinking only of surveyors?—No, every mining engineer also.

5326. (*Chairman.*) Every mining engineer?—Well, every person.

5327. (*Lieut.-Gen. Cooke.*) Who alters the features of the country?—Well, you could not perhaps make every private individual, who might choose to dig a pond in his garden; but the engineer you could make.

5328. (*Chairman.*) Let us see how far you would carry that; you would make surveyors to urban authorities do it?—Yes.

5329. Then surveyors of county councils do it?—Yes, decidedly.

5330. Then surveyors of railways, which are public works under statute?—Yes.

5331. Then we come to mining engineers; how do you get them in as distinct from any private individual?—You get them in through the Mines Act. We are compelled to keep plans of the workings, and I do not see why we should not be compelled to show any surface alterations that we may make; and send in copies of them. You will understand that I here refer to the surface only. We should object to the public seeing the plans of the workings.

5332. (*Mr. Roby.*) The obligation would be on the owner or worker of the mine?—Yes.

5333. (*Chairman.*) You would bring them in?—Yes.

5334. Any other class of person you could bring in?—I could not speak of the ordinary surveyor, but I should try to get the ordinary private surveyor too.

5335. In carrying out private work?—Yes.

5336. That would be the same thing as making it obligatory on every owner of property to do it?—That is what it would come to.

5337. Would that be practicable?—You can survey the property of a private owner, and I do not see why you should not go a step further—I mean the Government—and compel private owners to make the Ordnance Survey acquainted with alterations.

5338. The number of individuals that you would have to deal with would be so enormous and the dead weight of obstruction would be so great that you would never get through it, I think?—Possibly it is impracticable; it is only a suggestion.

5339. Then those plans being at the Ordnance Office you would suggest, I suppose, that on demand they should supply a manuscript copy?—I have no objection to that. My idea, however, was that the public should go and consult and copy them—not that the Department should be compelled to provide copies.

5340. And it would also facilitate revision?—Yes; and in fact it would save you, if you could trust those people—which of course you could not—it would save you from a great deal of revision. Well, I suppose it would simply mean checking; it would save you from revision, because you could check this work.

5341. You think the checking would be very much less work than making a new survey?—Yes; than a new survey.

5342. We had a good deal of evidence on this point. I was not aware that you had turned your attention to it, but it is a new point that you have made, that it should be extended to the mining engineer?—I would extend it as far as I possibly could.

5343. You are aware there are Ordnance Survey stations in various parts of England?—Yes, I believe so. I have never personally come in contact with them in any way.

5344. There will be no occasion specially to locate a surveyor in Newcastle; you would send to the head-quarters of your district?—I do not know where the head-quarters of the district are; there is not one in Newcastle.

5345. Not up to recently; the head-quarters have been shifted according to where the survey happened to be going on; but we understand that eventually permanent stations—not shifting—will be established for the purpose of revision?—Yes.

5346. Is there any other point?—Some of my friends think the price is too high. I think for the work we receive it is very low; but it is just a question, if you could sell the 6-inch map at a lower figure, there might be a very much larger demand.

5347. They are a 1s. now?—Yes; but you see that we often do not want the whole map, we only want a little bit, and if we could get these little bits cheap we should prefer to get them than to go to the expense of copying them. For instance, the 12 plans I am making now, if I could have bought the Ordnance for a few pence instead of copying them, I would have bought the Ordnance and put the work on to them.

5348. But the nine plans would have cost 9s.?—Yes.

5349. Would that be very expensive?—It is more than it costs me to make them, because for my purpose I do not require all the detail. I have no objection to the detail, but I do not require all the detail. All that my surveyor will copy will be the boundaries and the royalties, and a few important surface features which he will do in half an hour, I suppose, or less. It is just a suggestion for obtaining a larger sale.

5350. Perhaps you have in your mind the fact that you used to get four times the area—one sheet for 2s. 6d.?—No; I was not thinking of that.

5351. It now costs, of course, 4s.?—Yes, quite so; they used to be cheaper.

5352. And then what you now get for the 4s. is not so good in quality as what was supplied for 2s. 6d.?—I believe it is not.

5353. The 2s. 6d. sheet was an engraved sheet?—Yes; quite so.

5354. The reason being that the four 25-inch sheets, which are put up for the camera to photograph down, are as large as the camera can deal with?—I am not looking at it from the point of view as to whether we are getting value for our money. I think we are. It is simply a question of getting a bigger sale. If they could be sold cheaper I think mining engineers would prefer to use the 6-inch map for leases and other matters than to make a copy of it.

5355. Is there any difficulty in getting these maps through the agency?—There is no difficulty, if you know exactly what you want. If you know what you want and know the number and write up to Stanford, one gets it by return of post, or one's bookseller will get it; but if you do not know, there is for many

*Prof. J. H.
Merivale.*

19 July 1892.

people a little difficulty. I have no personal difficulty, because at our institute and our philosophical society here, we keep the necessary indices; but I quite understand some persons having a difficulty in getting what they want.

5356. I suppose at Newcastle you cannot buy them?—There is an agent, but I never go the agent.

5357. (*Mr. Roby.*) He does not keep any stock?—He does not keep any stock. I spoke to him some time ago and he said it did not pay him. I write to my bookseller and tell him I want certain sheets and they come direct from Stanford.

5358. (*Chairman.*) Do you not think 25 per cent. profit ought to be sufficient to induce them to sell them?—I have no idea. Then I have made an obvious suggestion which is quite impracticable, and that is, we wish we could print the maps upon something which would not alter in size or shape.

5359. On paper?—Well, paper I am afraid would alter.

5360. Have you any idea of the new material?—None whatever. I am afraid that is quite impossible.

5361. (*Mr. Roby.*) You know how difficult it is?—The map alters in size, and after a bit the surveys, taken a considerable distance from the original base, are very much out, unless you are careful to hear the fact in mind that the plan will alter.

5362. That equally applies to any drawn plans of your own, does it not?—Oh, yes; it would not apply to the Ordnance maps only.

5363. Do you think we are suffering from the 6-inch map not being an engraved map now?—You mean the quality not being so good?

5364. Do you think there is any practical difficulty?—I only use the maps of Northumberland and Durham, with very few exceptions. I do not know how they are produced; whether they are engraved or not. I am perfectly satisfied with them, so that if they are not engraved there is an answer to your question. They are engraved. I am perfectly satisfied with them.

5365. You have got the best quality?—Oh, I confine myself to these two counties. I can only speak for these two counties, and I think we are very well off there. We should like to see some more of them geologically coloured, but that you have nothing to do

with; but they are very good in the Geological Office in colouring maps for you if they are not in stock.

5366. Do you know anything about this 4-mile map which has been animadverted on. I mean 4 miles to an inch?—I never saw it. The scale would be of no use to me, it is too small. The half-inch is too small for any purpose that I would put it to, either as a tourist or as a mining engineer.

5367. You think that the Ordnance Survey Department are doing quite enough in publishing these four maps, the town map, the 25-inch, the 6-inch, and the inch?—I think these are quite sufficient, but I do not think they are going along with them as fast as the public could wish. I do not think it is any fault of the Ordnance. They ought to have a very much bigger sum voted by Parliament for the purpose; that seems to be the fault.

5368. Has your attention been drawn to the fact that it is the town survey on the very large scale which is the trouble?—No; personally I do not want the town survey. I do not suppose I shall ever buy one of those 1/500 maps, neither would mining engineers, I think; I do not think we want them.

5369. If it were not for those town maps the other maps of England would be produced with great facility and you would have had them a long time ago?—How does it stop you, for want of funds?

5370. The enormous time it takes to survey them, consequently a great amount of the money which is granted for survey is consumed in them, and then the smaller maps of those districts cannot be produced until the very large-scale map has been prepared?—Then it comes back to this; it is merely a question of money. If the Government would vote you 500,000, instead of 300,000, or whatever it is you get, you could get on proportionately quicker.

5371. It is rather a question whether this town map, having such a limited sale as you already mentioned—you say you do not want the town map at all—whether that should have been allowed to stop the way as it has done?—Yes.

5372. Or whether perhaps it would not have been better to survey on the 25-inch scale and leave the towns to provide for themselves?—Quite so, and when the map is done of course it would require a revision in 12 months—your town map.

5373. It would be costly to revise?—Yes.

The witness withdrew.

Adjourned till to-morrow, 30th, at 11 a.m.

Board of Agriculture, 3, St. James's Square, S.W.

FIFTEENTH DAY.

Wednesday, 20th July 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.
Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

General J. T. WALKER, C.B., F.R.S., late Surveyor-General of India, called in and examined.

5374. (*Chairman.*) How long have you held the office, General Walker, of Surveyor General of India?—I was five years Surveyor General of India, and 22 years Superintendent of the Great Trigonometrical Survey.

5375. How long have you retired?—Nine years.

5376. And you are well acquainted at present with the Indian Survey?—Very well acquainted with the Indian Survey.

5377. Perhaps you will make a statement to us of the general methods adopted in India?—I received a few days ago a letter from your secretary, in which he asked me to bring with me a written reply to the letter inviting me to give evidence here, so perhaps my best plan will be to read the first paragraphs that I wrote, in reply to your question:—

I think the maps of the Ordnance Survey compare very well with and are generally much superior to

*Gen. J. T.
Walker, C.B.,
F.R.S.*

20 July 1892.

those of the Indian Government, or of any Foreign Government. Of the maps of other countries I am of course most familiar with those of India, where I held the offices of Surveyor General and Superintendent of the Great Trigonometrical Survey for several years.

The Indian and the Ordnance Surveys are alike based on elaborate systems of principal triangulation; but whereas in the Ordnance Survey this triangulation is thrown over the entire surface of the country and forms a basis for secondary and minor triangulations, by which points are fixed for the checking and verification of all the measurements of the details of the ground, in the Indian Survey the principal triangulation is laid out in meridional chains one or two degrees apart, which are connected together by longitudinal chains about five degrees apart, and thus the survey of the interior details is nothing like so closely controlled by the triangulation, and is not nearly so accurate and precise, though it is sufficient for the requirements of the country. As regards accuracy of topographical delineation, no method of operation can produce better results than that of the Ordnance Survey.

But in one point the Indian Survey does more to satisfy the general requirements of the public; it not only produces maps on the scale of 1 inch to the mile, and on larger scales corresponding to the maps of the Ordnance Survey, but it also produces a general map of all India on the $\frac{1}{4}$ -inch scale, called the Indian Atlas, which is very useful and in great demand. The Ordnance Survey has systematically abstained from producing maps on smaller scales than the 1-inch, on the grounds that those maps would unduly interfere with private enterprise; but I cannot think this a sufficient reason for such a course. It has, however, recently and very happily departed from its long-established procedure by publishing a $\frac{1}{4}$ -inch map in outline, which was originally prepared, I believe, for the requirements of the Geological Survey. This is an engraved map, and very good so far as it goes, though it requires certain corrections to bring it up to date; but it has been unfavourably commented on, which, I believe, is mainly due to the disappointment caused by its not showing any of the features of the hills or of the principal undulations of the ground. I think these features should now be engraved on separate plates and printed over the existing outline maps, and thus a very useful small-scale map of the country—corresponding to the Indian Atlas—would be produced, which will be most serviceable to the general public.

5378. (*Lieut.-Gen. Cooke.*) Have you examined the new 4-mile map sufficiently to say that it is a well-executed map, and up to the usual Ordnance Survey style?—I have seen one large sheet, the principal sheet containing London and the ground around. I have heard it abused, but it seemed to me to be very clear and good. I could easily understand that, of course, it may be defective in some parts, because the work is not all brought up to date. I have been told by Sir Charles Wilson that that is only the case to a comparatively slight extent, and that the map might be corrected up to date at a cost not exceeding 100% as soon as the data are available from new surveys.

5379. What I wanted particularly to get your opinion on was whether the map was a well-executed map as far as it goes?—I think it a very well-executed map as far as it goes. I was quite astonished reading the article in the "Times" in abuse of it. It seemed to me to be an excellent map.

5380. (*Chairman.*) How far is India covered with the 1-inch map?—The survey of India was originally commenced on the $\frac{1}{4}$ -inch scale in the Southern or Madras Presidency at the commencement of the present century. The whole of India, excepting of course the recently-acquired portions of Burmah, for instance, and elsewhere, has been long ago surveyed on the $\frac{1}{4}$ -inch scale.

5381. (*Mr. Roby.*) And published; not only surveyed but published?—Yes, made and published on the $\frac{1}{4}$ -inch scale. For some years past topographical surveys on the 1-inch scale have been made of the Native States and the poorer and scantily inhabited portions of the British territories; the richer and densely inhabited portions—in the Ganges Valley, for instance, and in parts of the Bombay and Madras Presidencies—are surveyed cadastrally on large scales.

5382. (*Chairman.*) What is the scale, 6-inch or 25?—4-inch and larger, rising occasionally to 32.

5383. (*Lieut.-Gen. Cooke.*) Are those cadastral surveys printed?—The maps are all photo-zincographed; about 25 copies of each sheet in the first instance are printed, and more afterwards if required.

5384. (*Chairman.*) Do you remember when the 1-inch was first begun, because for that of course a different survey was required to what was wanted for the $\frac{1}{4}$ -inch?—The system of operation was the same, namely, plane tabling on a trigonometrical basis. I cannot say exactly when the 1-inch maps were commenced; they were being constructed in 1852-3 when I first joined the survey; it must be 40 or 50 years at least since the 1-inch survey was commenced. In the richer portions of the British districts surveys of another kind were undertaken which were called Revenue Surveys. These surveys were made on the scale of 4-inches to the mile; they gave the boundaries of all the villages with great exactitude by a theodolite and chain survey, and then the interior details were filled in by plane tabling. These maps were used to a certain extent for topographical purposes. They were reduced to form small-scale provincial maps, and to complete the 1-inch maps for general publication. These 4-inch maps were succeeded by the cadastral maps, as the wants of the country increased and civilisation advanced, and it was felt that more detail was required than the original surveys gave to supply the requirements of the day.

5385. Then you have succeeded in India in covering a very much larger extent of country with maps either on a cadastral scale or the 1-inch scale than what we have done in England?—Certainly.

5386. Why have you been able to proceed so very much quicker; can you give any reason why you have been able to proceed so very much quicker in India than we have been able to proceed in England?—The work is far rougher and less exact and can be more speedily executed; and large establishments can be readily formed for survey purposes if the Government will only give money; there is no difficulty in collecting and training men to a large extent.

5387. In India you think a much larger sum of money has been devoted annually to this work than has in England?—No, but the cost of labour is very much cheaper in India; it is only the European superior officers who are highly paid; the wages of the native subordinates rarely exceed 4l. a month, and probably do not average more than 1l.

5388. Have you any idea what amount of money has been spent annually in India upon this work?—The Survey budgets in my time used to run from 20 to 30 lakhs of rupees a year, or nominally from 200,000l. to 300,000l., though at the present rate of exchange of course it would be one third less, say, from 150,000l. to 200,000l.

5389. (*Mr. Roby.*) In your time I suppose the rupee would be about one tenth of a pound?—In my time the value of the rupee was about 1s. 10d., or was very much higher than it is at present.

5390. (*Chairman.*) Have you any engraved work in India or is it all photo-zincographed?—The Atlas sheets are all engraved.

5391. That is to say, the $\frac{1}{4}$ -inch?—Yes, $\frac{1}{4}$ -inch. The engraving was originally done in this country. The maps were prepared in India and sent home and engraved under the superintendence of the India Office in this country. The engraver was a Mr. Walker, who carried on the work for a good many years, and when he died the India Office determined to have nothing more to do with it, and a staff of engravers was sent out to India, and the engraving has been done in India ever since.

5392. And the hands now employed in engraving are mainly natives?—Natives are largely employed as engravers; they are very good line engravers; but when you come to the higher part of engraving, the mezzotint engraving for the hill work, we do not find the natives up to that work, in fact it is work that very few Europeans can do well.

5393. (*Lieut.-Gen. Cooke.*) With reference to the Chairman's previous question, I suppose the amount of detail in India is very much less than the amount of detail in England; and that this accounts for the more rapid progress of the Indian Survey. I suppose there is not so much to survey by a long way, is there?—In some of the richer portions fields are very numerous. There may then be more detailed survey work than there is here, for the fields are very much smaller than they are in this country. The cadastral work in

Gen. J. T. Walker, C.B., F.R.S.

20 July 1892

Gen. J. T.
Walker, C.B.
F.R.S.

20 July 1892.

places may be quite as great in India as it is in this country, but the work is not done with the same elaboration and care and minuteness of measurement. It is done mainly to furnish data which is sufficiently correct for revenue and settlement purposes, but it does not supply maps which have anything like the accuracy of the English Ordnance maps.

5394. (Mr. Brickdale.) You were saying that there is more detail in India?—I do not say there is more detail in India; I was only replying to a particular question. I think in some parts of India there is more detail, and in other parts much less. In the portions where the 1-inch topographical work is done there is generally very much less detail than in this country.

5395. (Chairman.) But the 1-inch map of India would show the same amount of detail as the 1-inch map of England, I suppose?—It will show as much detail where the same amount of detail exists, but in very many parts of India there are extensive plains without any detail at all, with the exception of a few village sites, and perhaps a few water-courses; there the 1-inch map will contain very much less than the 1-inch map of England would. On the other hand where the ground is hilly, and cut up with water-courses, there is much detail. In India you have no hedges, no fences, as in England.

5396. But that detail does not appear in a 1-inch map of England?—Well, no, it would not appear on the 1-inch scale, but it would appear on a cadastral scale.

5397. (Lieut.-Gen. Cooke.) But your cadastral survey would cover a great deal of that ground, would it not, for valuation purposes?—It covers a good deal of ground, but still only a small portion as compared with the area of India. I have not got figures, but I should say roughly that the cadastral surveys of all kinds in India do not cover more than one-tenth to one-twentieth of the whole area.

5398. (Chairman.) If it were one-tenth of the whole it would be a great deal larger in quantity than the cadastral survey of England?—Yes.

5399. So that you have carried out a cadastral survey over a wider extent of land in India than we have in England?—The cadastral survey ought to extend over a wider area in India, but its progress is much interrupted; it has its enemies and its friends. The members of the local governments which have to provide the money for it sometimes complain of its cost, and make constant attempts to alter the style of the survey; they feel that the work cannot be gone on with without some professional survey, but at the same time they want the professional surveyors to do as little as possible, not more than is necessary to serve as a frame-work to fit the interior details into; so they make the professional surveyors supply traverses of the village boundaries and the main lines of road, and they employ the village patwaris, as they are called,—men who are familiar with the details of the land revenue, and know how much every man ought to pay and where his fields are situated—to go over the ground and map in the fields as well as they can. The result is scarcely entitled to be called a cadastral survey, and it is vastly inferior to the cadastral work of the Ordnance survey; yet it is held by many persons to be sufficient for revenue and settlement purposes, and it is, of course, much less expensive than a purely professional survey. There are some parts of India that have been cadastrally surveyed professionally in excellent style. The maps are highly approved of, but then some of the administrative officers say: "This is more than we want; it is too expensive; give us something cheaper."

5400. (Lieut.-Gen. Cooke.) Do you use the plane table largely?—Yes.

5401. For the cadastral?—Almost all the filling in of the professional survey is done with the plane table.

5402. That would account for a very large difference in expense?—In England all the field measurements are entered in a book and tested against each other, and fitted and adjusted into the details of the triangulation. In India we have plane-table work, plotted on the spot, with very little numerical record of the measurements; the plotting is done within the lines of traverse, which are first projected on the plane tables. The filling-in is done very fairly well by the professional surveyors, but not nearly so well by the patwaris. Their work is, however, considered sufficient

for the requirements of the country by the majority of the district officers. A cadastral survey on the professional-cum-patwari principle is now being commenced in Bengal, where the local government has decided against the purely professional survey, and has insisted on the employment of the patwaris for the filling-in of all the interior details.

5403. Can you measure areas satisfactorily on this map?—The area of the whole village is measured very exactly.

5404. But I mean all enclosures sufficiently for selling purposes?—The measures are not exact, but are believed to be sufficient for revenue and settlement purposes.

5405. But sufficiently to sell land by?—Well, there are ups and downs about it, but still on the whole it is believed to be sufficient for the present requirements of the country.

5406. (Chairman.) You will be 10 per cent. wrong, perhaps, in your measuring?—10 per cent. may be the average error, but it is sometimes greater. If you allow 10 per cent. of error the work may be considered sufficient for the present requirements of the country.

5407. (Lieut.-Gen. Cooke.) We want greater accuracy in England?—You want it in England, of course.

5408. (Mr. Roby.) As I understand, you have got the 1/4-inch map for the whole of India, excepting Burmah?—Yes; but a first survey of Burmah has not yet been completed. The sheets of the 1/4-inch map will soon, however, be completed for all Burmah.

5409. Then, will it be true to say that the whole of India, excepting Burmah, has been mapped either on the 1-inch, the 4-inch, or the 16-inch scale; on one or another of those scales?—I would not say the whole. There are still some portions that are only surveyed on the 1/4-inch scale, but they are very few, and you may say, speaking generally of India, that maps of the whole country are now to be obtained on either the 1-inch, 4-inch, or the 16-inch scales.

5410. And, as I understood from what you said before, some richer portions have not been published on the 1-inch, but they have been done on the 16-inch; is not that so?—The richer portions of the British territories have not been surveyed on the 1-inch scale. The poorer portions and the whole of the Native States have been surveyed on that scale. The British territory is surveyed by two entirely separate departments, one called the topographical, and the other the revenue. The topographical surveyors do all the work on the 1-inch scale and the forest tracts on a larger scale. The revenue surveyors operate with the chief object of giving information for revenue and settlement purposes, and with a lesser object of producing topographical detail. They do the larger-scale maps, viz., the 4-inch, the 16, and the 32-inch maps.

5411. I suppose there are some parts of India that are still only on the 4-inch?—Some parts are only on the 4-inch.

5412. On the 4-inch and not on the 16-inch?—Yes.

5413. And not on the 1-inch?—There is a large portion of Bengal, I think almost the whole of the province, which has not yet been surveyed on the 16-inch scale.

5414. Nor on the 4-inch?—Portions have been completed on the 4-inch scale.

5415. (Mr. Brickdale.) Do you make large-scale plans of the towns?—Yes; not so large scale as are made here in England, but on 8, 10-inch, and 12-inch scales. There are some few towns, Calcutta, for instance, of which a very large-scale plan is made, and there are some few towns in the Bombay Presidency in which there are large-scale maps.

5416. (Lieut.-Gen. Cooke.) What is the largest scale; what has Calcutta—as large a scale as our 1/500 map?—No, I do not think it is so large as that. I forget the scale of the Calcutta map. I think it is probably about half the scale, 1/1000, but I do not remember the exact measurements.

5417. (Chairman.) Is that a Government map?—That is a Government map. It was not made originally by the Survey Department; but there was a civil engineer in Calcutta—I am speaking of what took place 40 or 50 years ago—a Mr. Simms, in connexion with railway work; an idea occurred to him that it would be a nice thing to have a large-scale map of Calcutta, and he commenced and carried it out; but that map has been

largely revised, and I think the work has all been redone. Of later years of course it required revision and alteration.

5418. Have the larger cities of India or any of them been surveyed on a similar scale?—Bombay is done on a very large scale. Madras also, but on a somewhat smaller scale.

5419. Delhi?—Delhi, fairly large; not very large. Bombay is a great mercantile place, and land there is immensely valuable.

5420. (*Lieut.-Gen. Cooke.*) Have the towns contributed to the cost at all; has Bombay or Madras contributed to the survey, or has it been done entirely by Government?—There are wheels within wheels in these cases. The Presidencies have generally got up surveys of their own. The officers of the Bombay Presidency, have carried out a kind of cadastral work for many years, which was very useful for revenue and settlement purposes, but absolutely valueless for producing topographical maps. Sir Bartle Frere himself saw that when he was Governor of Bombay. He sent for me, and I had consultations with him on the subject, and the result was that topographical parties of the Bengal Presidency which were under the Government of India were sent to Bombay to produce topographical maps; they made an entirely new survey, in which no use could be made of the previously completed very large-scale work.

5421. What I wanted to ask specially was whether the towns themselves, the municipal authorities, contributed, or whether the Government paid for the whole of the surveys?—I understood you to ask whether the Bombay or the Supreme Government paid.

5422. No; I meant to ask whether the municipal authorities contributed?—Yes; I think that has been the case in certain instances in the Bombay Presidency. Surat, Ahmedabad, and Poonah, were, I believe, surveyed partially at the expense of the municipalities, and large-scale surveys have been produced.

5423. Paid for actually by the towns themselves?—I believe with considerable assistance from the towns.

5424. (*Chairman.*) Is the 1-inch map where the cadastral map also exists reduced from the cadastral, or is it a separate survey?—The 1-inch map generally preceded the cadastral survey.

5425. Where both the cadastral map and 1-inch map existed, has the 1-inch map been reduced from the cadastral, or has it been created by a special survey?—It is difficult for me to reply exactly, for there have been varieties of procedure. Wherever the cadastral work was completed by the professional survey department, and was available before the 1-inch map was commenced, then the cadastral work has been utilised; but these cases are few; in most instances the cadastral work has followed the 1-inch map, and therefore could not be utilised.

5426. Wherever the cadastral work has been created first, the 1-inch has been produced by reduction?—When the cadastral preceded.

5427. (*Mr. Roby.*) Is there much of India where there are both maps, both the 1-inch and the cadastral?—Yes; a large area, though only a small portion of India. The cadastral maps are not in the hands of the general public. There are very few persons who care to employ them. They are chiefly for landowners and the district officers, who undertake the administration of the country. The maps exist, and are available to the public—to anyone who wishes to buy them; but very few ask for them; there is a very small demand for them.

5428. (*Chairman.*) The 1-inch maps have hills engraved upon them, all over India?—The 1-inch map is not engraved at all; it is entirely produced by photo-zincography or lithography.

5429. Has it got hills?—Yes, wherever hills exist.

5430. (*Mr. Roby.*) What is the mode of representing the hills?—The mode of representing the hills has much varied; 30 or 40 years ago the originals of the maps were far superior to what they are at the present day, because the hills were all shown in brushwork; but this had to be abandoned when photo-zincography was introduced, because it is incapable of reproducing brushwork, but can only reproduce work in lines; the consequence is that when photo-zincography was introduced the hills had to be drawn in lines, in the same style as the outline and other details. Thus, the originals of the present topographical maps are of

course not so clear nor so artistic as the old originals, in which the hills are done in brushwork or mezzotint.

5431. But are the hachures vertical?—No, they are generally horizontal; but the system is not the same all over the country.

5432. (*Mr. Primrose.*) Then 40 years ago did they engrave on copper?—They have engraved on copper for the last 80 or 90 years, but only the maps on the $\frac{1}{2}$ -inch scale; the 1-inch scale maps have never been engraved.

5433. They were produced by lithography before?—Yes, by lithography, and then there was always considerable delay in publication. Very often the original maps had to be sent home to England to be lithographed because there was not a sufficient establishment in India to lithograph them, and the consequence was that 30 or 40 years ago there might be an interval of 5 to 10 years between the completion of the survey and the publication of the maps. But now with photo-zincography the maps are usually produced within two or three months of the completion of the fieldwork.

5434. (*Chairman.*) With regard to the process, have you paid any attention to the respective merits of lithography and photo-zincography?—I have had a great deal to do with the subject.

5435. Would you express your opinion?—Artistically lithography is the best, but its slowness is the objection to it. The great advantage of photo-zincography is the rapidity with which it can be performed. For instance, during the Afghan war, some 300 plans were sent down from the Army to the Surveyor General's office in Calcutta to be reproduced as speedily as possible, and those plans were reproduced and some hundred copies printed of each in three days on an average, and in no case more than five days. Well, that is a result which could be achieved by no process in the world but photo-zincography.

5436. (*Mr. Roby.*) And produced in a style which was quite sufficient for practical purposes?—Quite sufficient for practical purposes; they were not artistic, but they were facsimile reproductions of the original maps with all their blotches and scratches.

5437. (*Lieut.-Gen. Cooke.*) Have you had sufficient experience of lithography and zincography to give an opinion whether it is possible by zincography to produce as good a result as by lithography. Putting on one side the topographic part, will zincography produce equally satisfactory results as lithography?—I have seen very good results from zincography.

5438. As good as lithography?—Well, I will not say as good; all depends on whether the work is done by hand on the stone or plate, or whether it is drawn on paper and afterwards transferred to the stone or plate. Handwork is preferable to transfers, and can be best done on stones; transfers are usually prepared for zinc plates; thus our lithography has usually been far superior to our zincography.

5439. (*Chairman.*) It has been represented to us here that considering that lithography produces better results, the process used at Southampton of zincography is a mistake. Have you any opinion on that point yourself?—I was not aware that the process of zincography was used at Southampton; I believed that the process employed was photo-zincography.

5440. Photo-zincography?—Yes; but you said in zincography.

5441. (*Lieut.-Gen. Cooke.*) Zincography is largely used at Southampton?—You mean printing from zinc drawings which are transferred to the zinc by paper.

5442. All the 25-inch plans are drawn on transfer-paper, laid on zinc, and printed from the zinc; nothing to do with photography. That is the original plan?—I thought they were done by photo-zincography. I am not very familiar with the details of the work of the Ordnance Survey. I have only been twice at the Southampton Office. I thought the cadastral maps were all done by photo-zincography.

5443. (*Mr. Roby.*) With regard to one point in the construction of the map—the contouring; in the Indian surveys is there much contouring on the maps?—Very little; it has sometimes been done in special cases when new cantonments were about to be constructed in the Himalayas; on the plains of course it is unnecessary.

Gen. J. T.
Walker, C.B.,
F.R.S.

20 July 1892.

Gen. J. T.
Walker, C.E.,
F.R.S.

20 July 1892.

5444. Has it been done in Bombay?—There has been no contouring in Bombay.

5445. Nor in Madras?—Nor in Madras that I have any knowledge of. There have been a few cases in the Himalayas, but they were exceptional cases done with a view to get information to assist the engineers in the construction of barracks.

5446. At Simla?—There has been a little contour work done at Simla, and the hills on the road from Simla to the plains have been contoured with the view to laying out the best line of road to get to Simla.

5447. Darjeeling?—Darjeeling has not been contoured to my knowledge. No contour work has been done at Massoree and Landour, but a little has been done at some other hill stations whose names I do not remember.

5448. In the main the maps do not show any contours?—No, there is no regular system of contouring in India as there has been in this country.

5449. (Chairman.) Are altitudes all marked pretty generally, or not at all?—They are largely marked in some of the maps. There is a great distinction between the revenue maps and the topographical in this respect. The revenue maps do not contain a single altitude, except occasionally of a trigonometrical point that may be on the map. But the topographical survey gives a large number of altitudes, derived from vertical angles which are measured *pari passu* with the horizontal in the trigonometrical work; special operations are also undertaken to introduce additional altitudes.

5450. (Mr. Roby.) And do the cadastral maps contain any conventional representation of sloping ground, or hilly ground, or any ground of that kind?—None whatever; the cadastral country is generally a dead level plain.

5451. (Chairman.) With regard to our own 1-inch map, can you suggest any improvements in the methods in which it is produced, or in its form or style?—I cannot; I think it is very perfect.

5452. You think it is quite satisfactory?—I think it is very perfect; very satisfactory indeed.

5453. Would you continue hill-shading, or would you think that an increased number of contours would be better?—I think that for the maps that are published in outline an increased number of contours, as were originally inserted, would decidedly be advantageous. I think it was about 1855 that contours were inserted at every 25 feet; but that method was suddenly abandoned, for Parliament thought it was too expensive, and restricted the contours to intervals of 100 feet. Contours at 25 feet are much more valuable than at 100 feet.

5454. It has been represented to us that hill-shading is a mistake, and that it is better instead to contour maps?—I think the hill-shading is a very great assistance in studying the configuration of the ground. Contoured maps are very serviceable for certain professional engineering purposes; but to convey a good general knowledge of the country I think hill-shading is indispensable, for the general public.

5455. In fact, in passing over a country, hill-shading is a better guide than contouring?—Certainly, it is a better and more speedy guide; perhaps it may not be serviceable to engineers who are laying out lines of road or anything of that kind, but for the general public, aiming to get a knowledge of the country, I think they would get it much more quickly from a hill-shaded than from a contoured map.

5456. Do you think it would be any considerable gain if the hill-shading were done in brown, or in a different tint to the rest of the map, instead of being done in black?—Yes, the introduction of a little change of colour is desirable. Certainly it would make the maps clearer; but it has to be done with great caution, because every new colour which is introduced means a new printing and an additional passing the paper through the press, all which entails a great deal of risk; it is almost impossible to preserve a sheet of paper at exactly the same size when it is passed through a number of presses, and if it does not retain its size, error is introduced forthwith. Maps in one colour can certainly be produced much more accurately than those in several colours, as the French maps which are in six or seven colours.

5457. You think, then, that the disadvantages of adding a colour would more than counterbalance the

advantages?—I should certainly like to see a certain number of maps produced in exactly the same way as that in which they are now; but for the requirements of the general public it may be desirable to have a little less precision, and some printing in colour.

5458. (Mr. Roby.) Have you noticed whether there is any great difficulty in keeping an accurate register?—That is the difficulty; registration is the great difficulty in producing maps in several colours.

5459. (Chairman.) Here is a map showing a flat bit of country and a hilly piece of country, both you see are in tints, the hill-shading in brown, and the other details in black?—This map, I think, has been done in another way; all the details here seem to have been primarily printed in black; and afterwards a shade or wash has been thrown over the hills. If double printing were only done to show the hills in a different colour, slight errors in registration would be passable, but if roads and rivers and other things are also shown in different colours, more and more accurate registration is required; there is more and more difficulty in doing it accurately, and less chance of success.

5460. (Mr. Brickdale.) I think we have been told that the hill-shading in any case involves two printings, so that General Walker's difficulty is met with in all maps as now printed.

5461. (Lieut.-Gen. Cooke.) Originally the hill-shading was put on the same plate as the outline, but lately Sir Charles Wilson thought it was desirable to try and keep it separate, in case coloured hills were wanted. In this case the outline has been put on one plate and a separate plate has been engraved for the hills. It is a double printing; the outline and hills in this case may be both black, or one may be black and the other brown?—In a case of this kind there can be no question that two colours are preferable to one.

5462. (Chairman.) If you have two printings, then it would be better that one of those printings should be in brown?—Oh, certainly; there is no doubt that is more pleasant to read than a single colour. If you have two printings by all manner of means have two colours.

5463. (Lieut.-Gen. Cooke.) I should like to ask General Walker one general question on this subject. There are many ways of showing hills used by foreign countries and ourselves. There is the vertical hachuring, horizontal hachuring, a large number of contours; contours filled in by brushwork, contours filled in with vertical hachuring. Now have you considered the question enough to say which you think best of all those, supposing a map had to be reproduced *de novo*?—For maps which have to be produced *de novo*, and which will show contours, I should certainly recommend vertical hachures between the contours.

5464. Contours and vertical hachures?—Yes, if the maps are only reproducible in lines; but I should prefer brushwork or mezzotint, if it can be reproduced in the printing.

5465. (Witness shown maps of Algeria and Swiss maps.) These are contours assisted by a little brushwork. Then there is one—I think Italian—which has contours filled in with vertical hachures. That is very effective?—Algeria is very clear.

5466. This map is one of Norway, horizontal contours filled in with mezzotint?—I think that is preferable to all. I simply mean that in a survey in which contours are done as a part of the fieldwork, when the contours are completed, the features of the ground should be shown in brush-shading on the original maps, leading to mezzotint on the printed copies.

5467. (Chairman.) You did not read us the whole of your paper—perhaps you will be good enough to read the remainder of it?—

I will now notice the complaints against the Ordnance Survey maps which are specified in your letter under the headings (a) to (h).

(a.) That the maps are in want of revision.—This is most true. In a large number of instances towns have been built, and considerable alterations to the face of the country have been made in the intervals—sometimes 30 to 40 years—which have elapsed since the original field surveys were made. The only alterations which appear to be systematically attended to and provided for, are the new lines of railway and the new growth around London. Thus the Admiralty surveyors in making their periodical maps of the coast line—which are always based, as far as possible, on the Ordnance maps—frequently find it necessary to make

large corrections and additions to those maps in consequence of changes which have taken place since the surveys on which they are based were made. The Ordnance Survey Department is, however, not responsible for this defect; its Director-General has repeatedly urged on the Government the necessity for further and more systematic revision, but his remonstrances have been ignored by the Treasury, and his proposals have been rendered impossible by the action of Parliament in largely reducing the amount of the funds which are sanctioned annually for the work of the Survey.

The Department is somewhat to blame in not always stating on the maps and the indexes the dates up to which the fieldwork of each sheet was completed; in many of the maps there is nothing to indicate whether the fieldwork is old or new. The dates should be engraved on the several copper-plates as soon as possible, to enable the public to understand better what it is, that is actually delineated on the maps.

(b.) *That the price of the maps is too high.*—I do not think the price of 1s. for an engraved $\frac{1}{4}$ -sheet, 18 inches by 12 inches, complete with hill-shading, is at all too high; but I think the price of sheets which are engraved in outline only, without hills, and also of exterior sheets with much blank paper, might be reduced. I believe Sir Charles Wilson is prepared to reduce the price of the quarter-sheets to 6d., if allowed to print them from transfers to zinc instead of from the original copper-plates. Reduction of price is most necessary in the case of the large-scale, cadastral, and town maps; they are printed by photo-zincography, and are therefore not nearly equal in style and finish to the engraved maps; but yet they are sold at higher prices per sheet. For this there are two causes: first, in calculating the respective prices, a curious distinction is made between the cost of production and that of publication, under which the cost of publication is made out to be greater for the inferior photo-zincographs than it is for the superior engravings, and thus the price of the photo-zincographs is increased; secondly, the engraved sheets are never coloured, but the photo-zincographs are published in coloured as well as in uncoloured sheets; when uncoloured they are priced at 2s. 6d., which of itself is too high, and when coloured the price rises considerably, to 8s., 10s., or 20s., which are prohibitory prices. The colouring is costly because it has to be done by hand, and the price of the sheet is further increased because of the provision which has to be made for the commission-fee allowed to the map agent, who is given one-third of the selling price of every map which passes through his hands. Thus he makes a far larger profit by the sale of the coloured sheets—for example, getting 10d. for each uncoloured sheet, and 5s. for every coloured sheet selling at 15s.—which materially increases the price to be paid by the purchaser. Yet the cost of the transaction to the agent is no greater for the coloured than for the uncoloured sheet; both require the same amount of space for storage, and the sale of the one is no more troublesome than that of the other. Thus it is evident that the present system of calculating the commission-fee should be altered, and the agent be given a fixed amount for the sale of each map, whether coloured or uncoloured.

If the cadastral maps were saleable in sufficient numbers to justify printing them in colours instead of colouring them by hand, the cost might be much reduced; but I am informed that the sale is too small at present to permit of this being done.

(c.) *That the maps do not show sufficient contours.*—When the contouring was commenced, contour-lines were laid down at 25 feet vertical intervals up to the tops of the highest hills. But in 1858 a Parliamentary Committee decided that this work was too elaborate and expensive, and from that time only the contours of 100 feet up to 1,000. with wider intervals above, have been given. These are quite inadequate to furnish a sufficient delineation of the form of the ground, especially in the lower features; and thus it is much to be desired that the system of 25-foot contours be reverted to and carried up to a height of at least 500 feet, with 50-foot contours above this to 1,000 feet.

(d.) *That the maps are not clear owing to their being printed in one colour only.*—As a rule the 1-inch maps are exquisitely drawn and engraved, and they are sufficiently clear to everyone who is skilled in map reading. But it is highly probable that the general public would prefer maps drawn in many colours. It has, however, been the business of the Ordnance Survey to produce the very best and most accurate maps rather than to cater for the fanciful requirements of the

public. Maps printed in several colours cannot be as accurate throughout as those printed in a single colour, as it is most difficult to preserve sheets of paper at a constantly uniform size when subjected to successive rollings in printing presses, and to bring them exactly into their proper places on the several stones or copper-plates during the course of the successive printings. Whenever the fitting is not exact the map becomes erroneous, so the advantages of several colours cannot be obtained without a sacrifice of accuracy, which may often be of material importance.

The many coloured map of France, on the scale of 1:500,000, has many admirers in this country; but it must be remembered that this map is not published by the French Survey Department, but by the well-known firm of Erhard in Paris for the Ministry of the Interior, and its basis is the 1:500,000 map of the War Department. In the Ordnance Survey it has always been contemplated that work of this kind which might be wanted in England would be undertaken by private firms, and some firm may very possibly be found willing to undertake it, if granted a sufficient subsidy for the purpose by the Government.

(e.) *That great inconvenience is caused owing to counties being in many cases drawn on different meridians.*—It must be admitted that the originators of the Ordnance Survey mapping did not sufficiently realise the importance of securing the projection of the details of the ground on such a system that the maps of all contiguous portions of the country, whether in one county or in another, should exactly juxtapose whenever put together. It was decided that all the 1-inch maps should be of the same size, viz., 36 by 24 inches, and that the details should be drawn in such a manner that the maps should practically face north and south, the meridians and parallels of latitude on each sheet coinciding as closely as possible with the marginal lines of the sheets. Now, in any system of rectangular maps, the greater the distance from the central meridian the greater becomes the obliquity of the meridians and the parallels from the margin of the sheets, and the greater the deviation of the sheets from facing to the north. In order to restrict this deviation within very small limits, the 1-inch maps of different parts of the country were originally constructed on different meridians, with the necessary result of producing as many groups of not exactly juxtaposable maps as the number of governing meridians. This evil has been overcome in the new series of 1-inch maps by the adoption of a common meridian for all England and Wales.

The 6-inch maps, however, are still drawn in separate groups, a group for each county, drawn with reference to the central meridian of the county. It is now too late to adopt any other method, but the inconvenience arising from it may be, and I believe now is, largely mitigated by inserting on the border maps of each county the contiguous details of the adjoining county, so that all the border maps contain a certain amount of detail common to the maps on each side.

In India the $\frac{1}{4}$ -inch scale atlas sheets are rectangular and projected with reference to the central meridian of India; the small-scale provincial maps are projected with reference to the central meridians of the provinces; the 1-inch topographical maps are not rectangular, but have the principal meridians and parallels for their marginal lines, and usually embrace an area of half a degree in longitude by a quarter of a degree in latitude; these maps juxtapose with sufficient accuracy.

5468. (Lieut.-Gen. Cooke.) Have you a scale in India at all equivalent to our 6-inch. If so, how do you manage about the meridians?—Our nearest is the 4-inch, and there the meridians and parallels are drawn as I have described, and the interior details are fitted in within them. The sheets are not rectangular.

5469. Each sheet is on its own meridian?—Each sheet is on its own meridian.

5470. But then the result of that is, that if you fit them together, they fit into an irregular shape?—The sheets are not rectangular; they are a little longer at the bottom than they are at the top.

5471. Then if you fit a number together they will become a semicircle?—The adjoining sheets between the same parallels will fit round the globe; and the sheets that are immediately above or below them will fit very closely when the maps are on a large scale.

5472. It was to obviate inaccuracy of fitting that every county was put on a separate meridian, and thus the map of each county is square?—But the map

Gen. J. T.
Walker, C.B.,
F.R.S.

20 July 1892.

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F.R.S.

20 July 1892.

of one county does not fit into the map of the next county.

5473. It was a choice of evils. You must have some error somewhere whichever system is adopted?—Yes, but by our system two sheets fit very closely, they fit so closely in the large-scale work that the objection of not fitting is nugatory.

5474. Still if you put a number together they must be in a curve. I do not think the British public would like that?—The error is too small for the public to appreciate it when the work is on so large a scale as the 6-inch.

5475. I should like to see it worked out on the 6-inch; it is very difficult to tell theoretically what the practical result would be?—There is some error, but it diminishes as the scale increases.

5476. There must be error; it depends on where you put it?—It would be nothing like so appreciable as the failure to join in the present system of county maps. But of course this cannot now be remedied; the progress of the 6-inch work has been far too great to admit of any fundamental alteration being made. In the atlas sheets of the Indian Survey we have an error running throughout the whole of them—not of projection, but due to the employment of an inaccurate scale when the engraving was commenced.

5477. (Chairman.) You have an error running through the Indian Survey due to what?—The man who laid out the maps originally made use of a scale the length of which was not correctly laid off.

5478. Not a true one?—No. And the consequence is that the scale of the survey is a very little less than a quarter of an inch to the mile. It is, I think, about one thousandth part less, which is a sensible quantity on each sheet, but the map is still called the $\frac{1}{4}$ -inch map, which it is not. That mistake was made at the very beginning, and we were obliged to have a copy of the false scale sent out to us in India, and have always worked on it.

5479. (Mr. Roby.) That is not exactly a mistake, the mistake is in calling the scale a $\frac{1}{4}$ -inch instead of something else?—The map is quite true to scale, but the scale is not exactly the $\frac{1}{4}$ -inch, though very close to the $\frac{1}{4}$ -inch; but if you were to take a foot rule and measure on it, you would at once find the mistake.

5480. (Chairman.) Will you continue to read your paper, General Walker?

(f.) *That the engraved maps are in some cases bad, (1) owing to the plates being worn, (2) owing to changes in style, and (3) owing to their showing too much detail.*—That some of the plates are much worn is very true; plates cannot be constantly printed from without becoming worn, even with every possible expedient for protecting their surfaces. The remedy then is to engrave a new plate; but the pressure of current work is too great to permit of this being done, more particularly with a reduced establishment; and so printing from the old plate has to be gone on with, even when the results are very disappointing.

"It is scarcely reasonable to complain that the maps are bad, because of changes in style, unless the change is to an inferior style, which is scarcely probable. When changes are decided improvements, they should surely not be disallowed on the grounds that they introduce differences from the style of the maps previously published.

"Whether the maps are injured or not by showing much detail is a matter of opinion on which different men will differ. A good map reader would probably not make this complaint, and would be very well satisfied with the maps as they are. A specialist might complain that there is too much detail which he does not want and too little of what he does want. The general public probably find more detail than they actually want; but this would scarcely justify the engravers to adapt the map for bad readers by the sacrifice of detail which can be inserted without overcrowding the map for good readers, and which having been surveyed ought not to be suppressed.

(g.) *That the names are in many cases incorrect.*—I know of no such cases, and I should suppose from the method which is adopted in the examination of the fieldwork, that they must be very few indeed.

(h.) *That the indexes are confusing and bad.*—The indexes in some cases give information which is not really wanting in an index, though it should be and usually is supplied elsewhere, and in all cases they withhold information which may be looked for very appropriately in an index. Thus the $\frac{1}{4}$ -inch scale

county indexes to the engraved and photo-zincographed 6-inch maps contain tabular statements of the areas of the parishes, which are given in the area books and are not wanted here, but they do not give the dates of completion of the fieldwork of the several sheets which would be much more useful to intending purchasers. In fact none of the indexes give these dates which are so necessary to show whether the map is correct up to the time of the requirements of the purchaser. The county index on the $\frac{1}{4}$ -inch scale, which shows the sheet-lines of the 1-inch, 6-inch, and the cadastral plans, has been not unreasonably complained of, because it does not show whether the 1-inch plans are published or not, and it does not give sufficient detail of the parishes to enable any person to decide readily which sheets of the cadastral survey he really wants. The new 1-inch parish index to the cadastral maps is very good and clear as far as it goes, but it should also give the dates of the fieldwork, and it would be improved with the addition of the numbers of the exterior surrounding sheets right round the margin. The indexes to the 1-inch maps contain no dates, and unless a person obtains both the index to the old series and that to the new series of these maps, he cannot ascertain whether the map he wants is obtainable from the new series or only from the old.

Having expressed my opinion on the points which were specifically brought to my notice, I wish to make some further remarks. I would observe that though the slowness of the work of the Ordnance Survey, which is so much complained of, is largely and primarily due to the arbitrary reductions which are made from time to time in the Parliamentary grants for the cost of the survey, it is also due in no small degree to the long time which is required for producing the maps by the process of engraving on copper, which has been adopted from the commencement of the survey. Engraving is a very beautiful art, but it is slow and tedious in producing even the names and general details of the outlines of roads and rivers, towns, and villages, &c. these are first inserted on the copper-plate; this is followed by the etching of the hills and the slopes of the ground, which requires great skill, and takes a long time to execute, so that after the names and outlines have been completed it may take one or two years to finish the etching of the hills. Very few men are to be met with who are capable of executing this kind of work, which is quite as difficult as the etching of the landscapes and drawings which are engraved from the works of the great painters in oil and water colours.

The arts of photography and photo-zincography, which have come into existence in modern times, are largely employed in the Ordnance Survey. Photography is most serviceable in diminishing the amount of labour which has to be undertaken in constructing the smaller-scale maps by reduction from the larger-scale originals. Photo-zincography is employed to produce preliminary or 'advanced editions' of some of the maps, immediately after the hand-drawing of the outlines has been completed; for by this process the map can be reproduced in a very few days, whereas years may elapse before it can be engraved. The artistic finish of a photo-zincograph is of course somewhat inferior to that of an engraving, but still very good results may be produced, and have been by the Ordnance Survey; I think the complaints which have been made of these maps are most unreasonable.

The great advantage of the process of photo-zincography is its rapidity. But photo-zincography has the disadvantage, that it will only reproduce drawings in lines, as with pen and ink; it cannot reproduce drawings in mezzotint or in brush-shading. Thus it has been customary in India for many years past to abandon brush-shading in the originals of the maps, and to draw the hills and the features of the ground in pen and ink, as the whole of the rest of the map. The result is that the original maps of the present day are generally much inferior in artistic finish to those of 30 years ago; but this is more than compensated for by their now being reproduced and published within a few weeks of completion, whereas formerly, several years might elapse between the date of the survey and the publication of the maps.

But maps in which the hills and the configuration of the ground are shown in the same way as all the other details are not so clear and artistic and easy to read as those in which they are shown by mezzotint shading. It would be a great advantage if the beautifully brush-shaded original maps of the Ordnance Survey could be reproduced by some process of photo-etching or heliogravure. This has already been done

in the Norwegian Survey, and if it were done in the Ordnance Survey, maps which are complete in all respects could be published as speedily as the present photo-zincographs, which omit all the hill-work; they would of course be inferior to the engraved copies of the same maps, but they could be produced far more rapidly, and would be very serviceable in supplying immediate wants, pending the completion and publication of the engraved maps.

Complaints are made that some of the principal towns fall in corners of the 1-inch sheets, and consequently that any person requiring a map of the town and immediately surrounding country has to purchase several sheets and put them together; this is more expensive, and produces an inconveniently large map. This might be readily obviated, and without much trouble, by the preparation, in such cases and for the more important towns, of special maps showing the town and the surrounding country to a convenient distance, whenever the Ordnance Survey has the leisure to undertake them.

It is also complained that the Ordnance maps of the coast line do not give any of the data of the soundings off the coasts which are given in the Admiralty charts. The Admiralty surveys are all based on the trigonometrical points of the Ordnance Survey, and also on the maps of that Survey so far as they are correct up to date; thus the soundings might be readily taken from them and inserted where they are wanted on the 1-inch Ordnance maps, as has already been done in some of the maps of the Indian Survey.

Frequent complaints are made by persons residing at a distance from London of the difficulties they experience in obtaining copies of the Ordnance maps. These difficulties greatly diminish the general utility of the maps, and prevent their being nearly so well known to and as readily at the service of the public as they ought to be. It appears very desirable that map agents should be appointed in each of the principal towns, instead of there being only a single map agent for all England and Wales, as is at present the case, under instructions issued from the Stationery Office, by which the agencies formerly existing throughout the kingdom were abolished, notwithstanding the strong protest made by the Director-General of the Ordnance Survey against such a measure. It has been suggested that the principal post offices should be supplied with sets of maps of the immediately surrounding districts for exhibition to the public, to enable all persons to ascertain readily what maps are available for their requirements. By some such arrangements as this the profits derivable from the sale of the maps might be largely increased, and the work of the Ordnance Survey be rendered much more useful to the general public.

I would now briefly recapitulate my suggestions in the order in which they have been made:—

I. That the $\frac{1}{4}$ -inch map of England and Wales, which has recently been published in outline, be completed by the addition of the hills and slopes of the ground.

II. That all revision which is required to bring the maps up to date be undertaken as speedily as possible; and that a systematic method of constant revision, to keep the maps correct up to date, be introduced. This is most essential, for the value of maps is greatly impaired when they are in need of such corrections.

III. That the price of some of the engraved maps, and of all the photo-zincographed maps, be reduced; and that the fees paid to the map agents for the coloured maps be the same as those for the uncoloured.

IV. That contours be inserted at 25 feet intervals up to a height of 500 feet, and at 50 feet intervals above that up to 1,000 feet.

V. That plates which are worn out be re-engraved.

VI. That the date of completion of the fieldwork in each sheet be shown on the sheet and in the indexes.

VII. That attempts be made to produce, by the method of helio-gravure, speedily executed copies of original sheets which are complete with the hill-work.

VIII. That special maps of some of the principal towns and the country immediately surrounding them be produced on the 1-inch scale as soon as this can be done conveniently.

IX. That soundings taken from the Admiralty charts be added to the 1-inch maps of the coast-line.

X. That the number of agents and places for the sale of the maps be largely increased.

(Several maps of the Indian Survey were now placed before General Walker.)

5481. (Chairman.) I will ask you now to look at the $\frac{1}{4}$ -inch map?—Yes, that is the Himalayas. These are

glaciers. That is a full sheet published many years ago. Latterly the map has been produced in quarter-sheets.

5482. All these rivers have been absolutely surveyed, not put in according to fancy?—Yes, the rivers, and in fact all the detail, has been surveyed, excepting of course on the higher Himalayas. This detail is done by plane tabling. The map is from actual survey work.

5483. (Chairman.) What are these boundary lines?—This is a revenue survey map. The boundaries are all village boundaries. This is the village; these tracts that you see here are cultivated tracts; these that you see here are waste lands.

5484. Those that have not got that little mark (*indicating*) are cultivated lands?—All that is cultivated. This is waste land and uncultivated land. All this land was uncultivated at the time when the survey was made; perhaps two or three years afterwards it might be cultivated.

5485. Are those fences or ditches, or what?—These are all sandhills.

5486. No ditch or anything?—No ditch and no hedges.

5487. What is that road? Is it a mud road?—Yes.

5488. What are those divisions?—Provincial and district boundaries.

5489. That will be a macadamised road?—Probably not a macadamised road, but a better road than most.

5490. A carriage road?—Yes.

5491. (Chairman, pointing to a topographical map.) The hill-shading is by horizontal lines?—By "eyelines." Here you have a number of heights. In this other map (of the revenue survey) you probably have not one single height. The revenue survey is done by men very few of whom, I suppose, get more than 2*l.* a month wages; whereas the men employed in the topographical survey will probably get perhaps 20*l.* a month.

5492. Both maps are on the same scale?—Yes, they are both on the same scale.

5493. (Mr. Roby.) Do you find the Indians capable of doing some of the better work?—Yes; Indians are very good hands indeed, provided they are properly supervised, but leave the Indian to himself and he generally fails. Under effective supervision he is as accurate as a man with ten times his pay. He can do very good work indeed, but he must be supervised; he cannot be trusted.

5494. Is that in all parts of India?—Some classes are better than others.

5495. (Major Johnston.) In the Indian Survey do they only use photo-zincography?—They also use zincography.

5496. (Chairman.) In mapping a river, the course of which is apt to change, do you show that in any way? Probably you have in India some rivers which shift a good deal. Is there any particular way of dealing with them in mapping so as to show the district over which they may shift?—I do not think anything is done in that way. When the course of a river has changed a great deal it has to be re-surveyed; sometimes they go on for years without changing their beds.

5497. (Mr. Roby.) Do you have anything to show the limits of the usual variation?—The variations are not shown.

5498. Some of the rivers might have a very wide bed?—Well, then, there is the edge of the bank; that, of course, is shown.

5499. (Chairman.) I will draw your attention to what Sir Charles Wilson says about the hill-shaded 1-inch map: "I think now I should like to mention 'with regard to the question of expediting the publication of the 1-inch hill map that I have considered the processes adopted in foreign countries. There are two good processes. One is the process of heliogravure; in that process the hills are drawn in ink on paper, and then they are photographed, and from the photograph a copper-plate is produced. I went very thoroughly into that question, and an officer of the Survey visited several of the foreign establishments. I found that in Austria, where they used it to a very large extent—and the head of the Cartographical Section of the Prussian

Gen. J. T. Walker, C.B., F.R.S.

20 July 1892.

Gen. J. T. Walker, C.B., F.R.S.
20 July 1892.

"Survey, who was over at Southampton a short time ago, told me the same thing—that it takes a very long time to train the draughtsmen to make the drawings"—The drawing in pen and ink is not what I propose for heliogravure. For heliogravure I recommend the maps which are drawn in brush-work, or mezzotint. This Norwegian map, in heliogravure, appears to be produced from an original map in brush-work, and is very different in style from the heliogravure maps from pen-and-ink work to which Sir Charles Wilson alludes.

5500. (*Lieut.-Gen. Cooke.*) I think they call the system the air-brush?—I have seen the air-brush work. They were attempting to employ the air-brush to produce hill-shading when I was at Southampton some years ago. I did not like the air-brush; it seemed to me too wholesale. You could not obtain with it anything

The witness withdrew.

Mr. J. G. Evans.

Mr. J. GWENOGFRYN EVANS, of Oxford, called and examined.

5502. (*Chairman.*) How do you describe yourself?—I am a student of old Welsh manuscripts, joint editor with Professor Rhys of the series of old Welsh Texts, and an honorary M.A. of the University of Oxford.

5503. Where do you reside?—I reside at Oxford.

5504. Have you given attention to the spelling of names on the Ordnance survey of Wales?—It is of the spelling chiefly that I wish to speak.

5505. Have you prepared a written communication which you wish to lay before us?—Yes; but I am afraid you will not be able to understand what I have written unless I make some preliminary explanation. First of all we have genders in Welsh. We have now only the masculine and feminine; we had once the neuter as well, and in the case of these old neuters there is some difficulty, as North and South Wales often treat them differently. In the vernacular the article is frequently omitted, but the mutated form is always used even though the article is absent.

5506. Do you mean that wherever you use the article you always get the change of form?—Yes; in the case of substantives regarded as feminine.

5507. It is not merely the difference between masculine and feminine?

(Witness here explained to the Committee the general laws of Welsh mutation, the use and misuse of the article, the masculine and feminine forms of adjectives, plural terminations, and the influence of the accent on the spelling of compound words.

In accordance with your secretary's request, I have jotted down a few of the principal points in which the present Ordnance maps of Wales are defective, as well as the best method of removing those defects. I must be understood to be speaking specially of South Wales, but as far as I have examined the maps of North Wales, they are equally at fault. To make a full statement, would be to write a treatise, and I fear that the members of this Departmental Committee are not anxious to master the intricacies of Welsh mutations or the laws of Welsh phonetics. I will therefore content myself with a bare enumeration of the defects, holding myself ready to furnish examples, and to be cross-examined at your discretion.

First of all I charge those responsible for the spelling of Welsh place names (a) with ignorance of the laws of Welsh mutation and phonetics.

(b.) With ignorance of the Welsh genders and of the fact that adjectives agree with their nouns in gender and number.

(c.) With ignorance of the use of the article which is constantly omitted where it should be inserted and frequently inserted where it is impossible.

(d.) With not spelling the same name uniformly alike, shewing they have no standard in their own mind. This is a natural consequence of (a) (b) and (c). For the errors arising under these heads there can be no kind of excuse; incompetency alone can account for them.

(2.) The recurring confusion of "Llan," and "Glan,"—words meaning things so different as "church," and "on the bank of." These are constantly mixed up in a hopeless way.

(3.) The presence of folk-etymology, and of words that are impossible in any language known in these islands.

like the delicacy of expression which is to be found in some of the Ordnance maps of Scotland. Some of those maps are superb; they cannot be rivalled, at least they cannot be improved on.

5501. (*Chairman.*) Those are all produced in the first instance by brush-work?—Yes, all the originals show the features in brush-work. My idea is this: that if the Department will take one of their maps done in brush-work and reproduce it by heliogravure, as appears to have been done very successfully in Norway, they can speedily produce a very valuable map for the general purposes of the public. Whereas if they wait until the engraving of the map is completed in line, and etched, it may be a matter of three or four years or longer before the plate is ready, because the work must stand over until the men qualified to undertake it are available.

(4.) A series of separate words are strung together (sometimes with hyphens and sometimes without) as if they were so many syllables forming one word, thus producing most astonishing results.

It is from examples of this method of forming words that many English people derive their singular impressions of the Welsh language. Englishmen seem to think that if they string freely together ll's, dd's, and ch's, they make a Welsh word. We are constantly told that our language consists of an aggregation of consonants, but my reply always is that we have no such word as "strength." There you have seven consonants to one vowel, and I challenge anyone to find any approach to that in Welsh.

5508. (*Mr. Roby.*) The reason for the prevalence of that idea is that "w" and "y" are regarded as consonants?—Yes, that is so. For instance, take the word "llwyn," that is said to be all consonants, whereas the "w" and "y" form a diphthong.

(5.) Occasionally purely Welsh names are spelt as if they were English names, and by this method the Englishman and the Welshman alike are confused.

(6.) Names are sometimes spelt according to local pronunciations and often in defiance of it."

5508a. What then are your recommendations? They are as follows: I would recommend:

(1.) "That there should be followed a uniform standard of spelling the same name, at least in the same locality where there is no difference of dialect to justify variation. But at the same time special care should be taken not to obliterate old forms which have come down to us, and are still preserved in the living speech of a district."

This is particularly applicable to Monmouthshire and some parts of Glamorganshire, those parts which were settled by the English people as far back as the time of the Conquest. I find there are many names there still spelt as I find them spelt in a MS. of the 12th century.

"(2.) That the influence of the article, the laws of phonetic growth and decay, of mutation, and of gender should invariably be observed.

"(3.) More care and attention should be given to marking the sites of places of historical interest. It is hard to understand the principle of omission at present practised."

I find for instance that if a man has made a little money and built an ugly villa that is put down at once, whereas it may be that a place which has figured in Welsh history from the 8th century down to the 16th century is simply left out.

5509. (*Chairman.*) Is that so on the new 6-inch maps?—Yes. One that I have brought with me has an instance of it. I find "The Carpenter's Arms" and names of that kind are all put down.

5510. (*Mr. Roby.*) Are you referring to the 6-inch?—I speak more particularly of the 1-inch, but there is very little to choose between them. Having access to the Bodleian Library I am able to consult the 6-inch maps.

5511. You are not thinking of the larger scales?—I have not gone into anything larger than the 6-inch.

5512. (*Chairman.*) Have you any maps here?—I have some here which I have marked with a view to illustrating all these points.

"(4.) The same characters should be uniformly used to express the same sound. It is particularly necessary to distinguish between the letters "l," "dd," "th," and "f" in Welsh place names from those used in English names occurring in Wales, Monmouthshire, and the Marches. This can be most easily done, as I shall be happy to point out.

"(5.) Many towns have a Welsh and an English name. Where both names are in current use, care should be taken to indicate the fact in all cases."

5513. (*Chairman.*) Both names should appear on the map?—Both names should appear.

"6. A very serious defect indeed is that of not supplying the names of a very large number of brooks, which are of paramount importance in fixing historical boundaries. I counted one day over 30 brooks whose names I knew, and not one of which had its name on the Ordnance Survey maps. The late Professor Freeman used to teach us at Oxford that there was no way of learning history without maps, but in the light of recent experience it seems to me that not a little depends on one's maps. For six months I have been groping my way about Monmouthshire in particular, and South Wales in general, and of the scores of boundaries minutely defined in the *Liber Landavensis*, hardly one in five of the brooks mentioned are to be found by name in the Ordnance Survey maps. I respectfully submit that this should be remedied."

I should say that the *Liber Landavensis* is a document of about 1150, and is a record of the See of Llandaff, supposed to have been drawn up by Bishop Urban.

5514. (*Mr. Roby.*) Is there any difficulty in recognising the place from the book?—Infinite difficulty, especially when you come to remember that there are "llans" by the score, I was going to say by hundreds. Then there is the brook name "dubgleis"—modern "Dulas"—which is of frequent occurrence. You find one named here and there, but not nearly all of them.

5515. (*Chairman.*) Is that name absent from the 6-inch map?—Yes; I know several brooks of that name which are not named at all on the Ordnance maps. I have gone carefully through the 6-inch maps of Glamorganshire and Monmouthshire.

5516. There are a good many names in the 6-inch map which do not appear in the 1-inch?—No doubt that is so.

5517. (*Mr. Roby.*) Your complaint is not so much that the names in the map are different from what they ought to be, but that there is no name at all?—Yes, that is so; that is especially applicable to the English districts in Wales.

"(7.) Then again the lines which indicate the respective courses of the brooks should be distinguishable from other lines and distinctly engraved throughout their length. Many of the brooks appear and disappear as if they played at hide-and-seek, and in some cases do not empty themselves anywhere; they simply vanish.

5518. That is not actually; on the map?—On the map.

5519. (*Chairman.*) Is that on the 6-inch or the 1-inch map?—I am speaking of the 1-inch now. There is one brook in particular I have tried to trace on the 6-inch map, and I cannot trace it at all; but there is a poor map supplied by the "Royal Gazetteer," and there you have a heavy line going all the way down to the sea, and I fancy that that is as deceptive in its marking as the other in its absence.

5520. (*Mr. Roby.*) Those you refer to are substantial brooks, and ought to be marked?—Yes. All the care seems to be devoted to marking railways and tramways—about the last thing any sane man (who was not a railway contractor) would think of consulting an Ordnance map about. As each great system of railways supplies us with adequate maps of its lines along with the official time tables, I do not see why the 1-inch map should be encumbered with ugly lines which disfigure the maps and crowd out important names. I should like generally to plead for greater simplicity, for more thoroughness, for accuracy, and for distinctness of lines and lettering. In the 1-inch some distinctions might be omitted, such as whether a road is fenced or unfenced, but I should like particularly to get the springs of the rivers and their tributaries so marked that they can be distinguished from the lines which at present mark a boundary. For instance, I cannot often trace the boundaries

of the parishes either on the 6-inch map or the 1-inch map. It may be my stupidity; but I have asked several other gentlemen, who are equally at a loss. I find in the new map which has been sent me by your secretary that there is an attempt to explain some of the lines; but in the older maps there is no explanation whatever.

It has further been suggested to me by your secretary, that I should point out a way of remedying the defects I complain of. The idea of requesting some Welsh Antiquarian Society to aid in the work is a splendid one, if it is desired to shelve the whole matter. What is everybody's work is nobody's work. Besides, the chief qualification of membership in a Welsh Antiquarian Society is, as a rule, the ability to pay a guinea annually, and that is not a qualification that will advance us very far. Ability to speak Welsh is no qualification in itself. You require much more than a fluent use of the vernacular. To do the work properly you want a man who has, besides enthusiasm for the work, a knowledge of Welsh in all its historical stages; one who has a first-hand knowledge of its phonological developments and disintegrations, of its historical and literary documents. Perhaps Wales could not furnish you with half-a-dozen such men, but if one can be found that would suffice for your needs. Having found the right man I should make him responsible for all the spelling, empower him to add brook-names and historical sites, and give him control over the engraver's work to the extent that they do not spoil his work by the introduction of errors of their own. In some cases it would be advisable to empower him to visit certain localities where names of brooks cannot be elicited by correspondence of which in any case there would have to be a considerable amount.

5521. (*Chairman.*) Do you know how the thing has been done up to the present time?—I have not the smallest notion.

5522. Then, I will read you what the Director-General told us. He says: "I should like to explain "with regard to the Welsh names. The Welsh names "are collected in the same way; there are three "authorities for each name. At the commencement "of the Welsh survey the difficulty of getting the "right orthography was recognised, and Major-General Owen Jones, the officer in charge of the "boundary office, who is himself a Welshman, and a "good Welsh scholar, recommended Mr. Rowland, "who was also a Welshman, and according to our information a very good Welsh scholar as a referee. "Every name that appears on the map was sanctioned by Mr. Rowland until his death. When "Mr. Rowland died, before the names on the map "were completed, it was stated that Mrs. Rowland, "his widow, was an equally competent Welsh scholar, "and she was appointed referee in succession to "her husband. Every name after Mr. Rowland's "death was submitted to Mrs. Rowland. I do not "think the Survey could have done anything more; "every name has been submitted to persons who are "reported to be competent Welsh scholars"? I know that Mr. Rowland wrote a Welsh grammar, but I should not call him a Welsh scholar; and if he was responsible for the nomenclature of the maps, the result shows him to have been a man absolutely incapable for the work. With regard to Mrs. Rowland, of course I do not wish to speak disparagingly of that lady, especially if it would do her harm in the matter of her income, or anything of that kind; but to say she is competent is to make charity cover a multitude of sins. As I have pointed out, it requires a man who has received a thorough training in modern scientific methods.

5523. You think there would be great difficulty in getting a person?—Yes.

5524. You say you could point out two?—Yes.

5525. Do you suppose that other people would agree in your selection?—I would refer you to Professor Rhys, whose judgment would be accepted by all competent persons.

5526. (*Lieut.-Gen. Cooke.*) What is Professor Rhys professor of?—He is professor of Celtic, Welsh, and Irish at Oxford.

5527. (*Mr. Roby.*) Is this system of which you speak one that is generally recognised now by Welsh scholars?—I have not recommended any specific system, but merely pointed out that you require a properly trained person to carry out whatever system is adopted.

Mr. J. G. Evans.

20 July 1892.

Mr. J. G.
Evans.

20 July 1892.

5528. It is not one particular school which for the moment is in the ascendant?—No, not at all; what I may call the literary system is generally recognised. There is this to be considered; the man you appoint should have a free hand; he should supply information as to whether he is giving the local pronunciation (which, if properly done, would be simply invaluable in the matter of Welsh studies) or whether he is following the recognised literary standard of spelling.

5529. Spelling according to the origin and meaning of the word?—The attempt to give the original meaning of the word is beset with danger. If you represent the local sound, a scholar will generally find out what the original form of the word was; an ignorant man theorises as to what the name must have meant and puts it down accordingly.

5530. You distinguished the method of ascertaining the local pronunciation from another system?—Yes; from that which is regarded as the literary form. You may spell a word in English phonetically according to its sound, as Mr. Pitman would spell it, or you may spell it according to the usual standard of spelling. Now, in the maps, we have both methods mixed up, plus folk-etymology and other vagaries.

5531. Taking the literary form of the word, would the pronunciation of that word in your mouth or that of Professor Rhys be fairly identical with the local pronunciation?—One would know then accurately what was meant. Take for instance the termination “-au,” which is never found in our early literature. But the later version of the Bible and the newspapers have made it literary and current in modern Welsh, though very few people know that “-au” is a modern invention. Scholars know that in some counties this termination is pronounced “-é,” and in some counties something between “-é” and “-ah”; but no dialect sounds “-au.”

5532. Take the literary form of the name of some village in Montgomeryshire or any other place you like, should you, in pronouncing that, pronounce it approximately in the same way as the local people would pronounce it?—Yes; I should know how to do it because I know something about Welsh dialects.

5533. It is not that you are distinguishing between the local pronunciation and another pronunciation?—No, not at all. Welsh spelling is, on any system, approximately phonetic. There are no anomalies corresponding to the English mutes in Leicester, Holborn, Teignmouth, Crewe, &c. Our anomalies are something like your Derby, Berks, &c., when you write e and sound â. In this class of words you retain an effete spelling, whereas our charlatans have invented the “-au” anomaly. Again, in compounds like “Carmarthen” and “Argod” it is the fashion with our charlatans to ignore the shifting of the accent and its influence on pronunciation, and to write “Caermarthen,” “Argoed,” &c., which represent neither literary nor local pronunciation.

5534. You are distinguishing simply between two modes of representing the same pronunciation?—No; not exactly that. You may either represent the thing accurately as it is pronounced, or you may give a literary form to that pronunciation. If you give an accurate phonetic form, every scholar will know the literary form to give it.

5535. (Chairman.) Have not most of these names a local form of spelling; are they not spelt?—They are spelt, certainly.

5536. Should not what goes on the map be the local way of spelling?—That would be an excellent system, but it would be hardly feasible; you would have to send the man all over the country to ascertain the sound on the spot, and even then there would be a difficulty.

5537. (Mr. Roby.) And moreover, I take it, that in that case you would have a spelling on the map which would be pronounced differently in different parts of Wales?—And so it would be spelt differently.

5538. (Chairman.) That is the case in England. The Ordnance Survey people have taken the names as spelt in the various localities; they have not attempted to find out what the names mean?—They should not.

5539. (Chairman.) Will you show us on the map the extent to which these errors go?—This is a 1-inch map (Glamorgan), which though bought last February is shamefully indistinct. I have marked instances here of the incorrect spelling of Welsh names. I will take both the old map and the new, if you will allow me.

and show how the errors have been copied from the one to the other. Maerun is the Welsh name of Marshfield; the name occurs in the *Liber Landavensis*; but I had a difficulty in finding it, because only the English form is given on the maps.

5540. I think we are quite agreed that where there are two known forms, English and Welsh, both forms should be used?—There is another place called Llan Sannor, (misspelt Sannwr in the new map) alias Thaw. Both forms should be given on the map. If you refer to Lewis's Topographical Dictionary you will find that the two names are given.

5541. I see that on the 1-inch map you have underlined a good many names?—They are most of them mistakes; some I marked with a view to verifying; others for comparison.

5542. In the case of Cefn-logell, you say that the “l” ought to be two “l’s”?—Yes. (Witness pointed out other instances of inaccuracy in spelling.)

5543. Is there a sufficiently fixed standard so that no other Welshman would find fault?—Yes.

5544. There would be no difficulty in getting a person whose authority would be accepted?—No; he would act in accordance with the well-known laws of mutation and gender, which prevail throughout North and South Wales.

5545. (Mr. Brickdale.) Would it be satisfactory to have his name on the map?—Highly satisfactory, because he would have the credit of his work, and there could be no better inducement. He would supervise the Welsh names, and be entirely responsible. Of course if his name is put on the map, he should be given full control over the engraver's orthography. Let the whole responsibility be put upon him, and for the sake of his own credit he would do the work in such a way, that you could not get it as well done otherwise.

5546. (Chairman.) All we can do at present is to say that the present system is unsatisfactory, but we cannot make ourselves masters of the system you propose should be adopted?—I do not wish it to be understood that I advocate any system in particular, but that some one system should be adopted and followed uniformly.

5547. Will you say, with reference to this map, that all the words carried out in the margin are incorrectly spelt. I want to get some evidence to show the extent of error in that sheet?—Most are errors; but some are right, and have been put beside the errors to show that the same name is spelt variously. I have gone over a sufficient area of both the old and the new map to show that precisely the same mistakes occur in both.

5548. (Lieut.-Gen. Cooke.) Can you draw up a table of what is on the map and what ought to be on the map?

5549. (Mr. Roby.) I would also suggest that a few words should be added as to the way in which the spelling should be regulated for the future?—It takes considerable time to go through all the names and pick them out. I have spent about five days in doing what I have done.

5550. (Chairman.) You have been all over this sheet?—Yes.

5551. We will not ask you to go over it again. Do you think you have marked all the errors?—I have simply picked out a class of errors. (Witness gave instances.) There is Bishopool; that is an error introduced into the new map. New Wallace and Old Wallace are other instances of fresh errors; the word is Gwalas, and means a level.

5552. (Mr. Roby.) It is not the name of a place: it is an indication of the state of the ground?—It is a place name. The place has been so named from the nature of the ground. In a purely Welsh district they would be Yr Hen Walas and Gwalas Newydd. We have no mute vowels at the end of words. Another name is Maindee (Maendy). That is a fresh error; dee means nothing at all. “Maindy” means a house built of common stone, which was a new thing in the neighbourhood where the name was first adopted. Whether the first syllable *Main* is right I cannot say. It might be an instance of a 12th century spelling fossilised by Saxon invaders. The modern form is Maen. Here is an instance where local pronunciation is everything, as both forms are literary, but one of them has been obsolete for eight centuries.

5553. (*Chairman.*) We can see from what you have told us that there is great room for improvement. We will ask you to kindly add to your evidence a letter, stating that on Sheet 232 which you showed to the Committee there were certain errors. Perhaps you could tabulate for us a selection of names showing the errors and what you think they ought to be, adding the reasons. I should have thought from the care taken with Mr. Rowland and Mrs. Rowland it would have been tolerably correct?—It is a hopeless thing to expect from any man who has not received a proper training.

5553a. The old map is pretty full of names?—Yes; the new one is not nearly so full. I think it stands to reason that you should include those names which have historical associations, and not merely the last public house built.

5554. I agree with you; the thing is how to get it done?—Were a competent person appointed he could easily remedy most of the defects.

5555. (*Mr. Roby.*) The correct form of these names which are wrongly written will be, as I understand, the literary way of writing the local pronunciation?—Yes; only you cannot say that you write the local pronunciation in a literary way. For instance, if you spell "Holborn" in the usual way, and you go out into the street and hear it called "Hoborn," that is not writing it according to the local pronunciation.

5556. I said the local pronunciation, not the pronunciation of the boys in the street?—The local pronunciation is the pronunciation of the boys in the street. By *local pronunciation* I mean one that is peculiar to the place—one that an outsider could not know without being told.

5557. I will not argue that. I want to show you that distinction. Is the system you would adopt a system which would be universally accepted?—Yes.

5558. You say certain names on this map are wrong. You are going to give us what they ought to be?—Yes. (See Appendix XX.)

5559. Will you describe what you are going to give us; what that really means?—It is as if you spell Holborn in the proper way.

5560. How do you describe that?—I call that the literary form—the accepted form—but it does not necessarily represent the local pronunciation, because the local pronunciation is the pronunciation of uneducated natives, whose pronunciation is very often far more helpful than that of the educated man when one wishes to get at the original meaning of the word.

5561. (*Sir A. Geikie.*) How do you get at it?—There is no difficulty at all if you know the language; if you know that, the place called Holborn is so spelt.

5562. I am talking of Welsh?—Precisely the same rule applies to Welsh as to English.

5563. You have a word pronounced in a local way: one Welsh scholar will say that it ought to be so-and-so, and another will say that it ought to be so-and-so?—That may be true of one word in a thousand.

5564. (*Chairman.*) You think the forms of spelling are pretty well settled by literary Welshmen?—Yes; there is no difficulty whatever in the matter; but if you adopt a system of representing sound then there would be a difficulty.

5565. (*Sir A. Geikie.*) What I should like to know is how, from the local pronunciation, the literary pronunciation is to be derived? (*Chairman.*) I do not think it is correct to guess from the pronunciation of a word what its meaning is?—A name that occurs in one of the maps is "Pen-y-fan." That word as spelt means the "head of the wild beasts' lair." The true form is Pen y Vei (modern Pen y Vai). *Vei* means much the same as *Maes*, an open space, field, or meadow. That is a case of incorrect etymology vitiating the spelling.

5566. (*Lieut.-Gen. Cooke.*) Why not "head of the wild beasts' lair"?—Because such a name does not occur. But the other name occurs all over Wales. Not only

The witness withdrew.

Mr. G. J. WILLIAMS, F.G.S., called and examined.

5575. You are a Fellow of the Geological Society?—Yes.

5576. Where do you reside?—At Blaenau Festiniog.

that; but it can be proved by documentary evidence. It is possible there may be disagreement as to a word here and there. There may be disputes even amongst doctors, but the words I am speaking of are for the most part of constant occurrence, about which there can be no possible doubt among Welshmen at all

5567. Supposing you find the word "roc"?—It all depends upon the spelling of "roc." If I found it "roc," I should retain it; I should not spell it "rock." It might contain an important piece of historical evidence. Supposing it were a Norman French form, we should know that a Norman had settled there.

5568. That might or might not be?—It might be a sheer accident; but if it were an accident it would not be repeated for centuries.

5569. What I mean is, that I think there is great danger in always trying to bring the thing into a meaning, when possibly it has not a meaning. Take that word "roc," for instance?—Precisely so; my recommendation is that "special care should be taken" not to obliterate old forms, which have come down to "us, and are still preserved in the living speech of a "district."

5570. (*Chairman.*) It is quite clear there is a mistake in spelling, owing to ignorance of the use of the articles; but we cannot say whether the blame rests with Mrs. Rowland or the engraver. There is probably no one in the Ordnance Office who can check mis-spelling. The matter is in the hands of the engraver. The engraver, for instance, might leave out the "u" in such a word as "house"?—If that were done habitually it would lead to a new form of spelling. Supposing I were to spell "Holborn," "Hoebourne" or "Holeborne," would you, as Londoners, consider that a fair way of dealing with it, supposing that Welshmen had the control of the maps, and they spelt English-place names on that principle, which is largely the case at present as regards Welsh-place names.

5571. An attempt was at all events made to deal properly with this matter. A Welshman at the head of the Survey selected another Welshman who it was thought was a scholar, and the matter was placed in his hands. I do not think the Ordnance Department was to blame in the matter; though they may not have been happy in their choice, or the work may have been carelessly done. That is one of the things we have to report upon, and I think we are bound to report, after what you have told us, that the system of Welsh names should be amended?—There are at least 50 errors of the kind mentioned in my paper, in this map (Glamorgan), and this is not exhaustive of all the names in the map; but looking generally over the Welsh maps, I find that somewhat the same proportion prevails. I have not selected any district particularly; I am able to point these out simply because I happen to have been working at this map for the last two or three weeks; I have not been making a selection from what I consider to be the worst district. If I were to do that I should take that part of my native county of Cardigan, where I know every nook and corner.

5572. (*Mr. Roby.*) That would take you some time?—I should have to do the work all over again.

5573. (*Chairman.*) We do not want that. We want something definite to base our report upon?—I understand, then, you will send us a column of names with your corrections, and your reasons for making them, and then we shall have all the materials from which we can make our report?—I shall arrange my materials differently according to your suggestions, but you must allow me to repeat that I do not wish to be understood to be advocating the representation of local pronunciation at all, but that whatever system be adopted it shall not be liable to the vagaries of the present one, but shall follow uniformly some intelligible principle.

5574. I know what you mean. The Welsh spelling and pronunciation stand in the same relation as our spelling and pronunciation of the word "Holborn"?—Yes; there are instances in this map where the same word is spelt differently; some definite form should be fixed upon and adhered to.

Mr. J. G.
Evans.

20 July 1892.

Mr. G. J.
Williams,
F.G.S.

Mr. G. J.
Williams,
F.G.S.

20 July 1892.

5578. Will you read the memorandum you have prepared?—Yes.

"Having been asked to select one 6-inch sheet of the Ordnance maps of Wales on which to give evidence as to the correctness or otherwise of place names shown on such sheet, I have selected Sheet XI., Merioneth, and beg to append a list of inaccuracies in spelling and otherwise in the same, as far as they are known to me at present."

I have written down the names as they are on the map; how they are locally known, and how I think they ought to be spelt:—

Sheet.	Place Names.	
Merioneth.	How printed on Maps.	How locally known.
XI. N.E. (1.)	Ogof-llechwen -	Ogof Llochwyn.
	Hendre-gwen-lyffaint -	Hendre Gwennlian.
	Bron-miriant -	Bron Meirion.
	Rhyd-y-gyffiniau -	Rhyd y cyffiniau.
	Cae'r-golen -	Cae'r gorlan.
	Hafod-y-fynydd -	Hafod y mynydd.
	Cae-valley -	Cae Fali.
	Criau -	Criau.
	Bron-turnol -	Bron Turnor.
	Glan-Gwilym -	Glan William.
	Llechryd -	Llechrd.
	Rhoslyn -	Rhos llyn.
XI. N.W. (2.)	Tan-tŷ -	Pandy.
	Bewdy-newydd -	Bendy newydd.
	Ogofordronwy -	Ogo' Ronwy (Ogof Goronwy).
	Maes-gwyn-llwyn -	Maes gwyr Lleyn.
	Pant-y-mewydd -	Pant y meusydd.
XI. S.E. (3.)	Coed Cae-valley -	Coed Cae Fali.
	Nant-Prefor -	Nant yr efail.
	Nant Glan-offer -	Nant glau hofer.
	Glan-ddol -	Blaen ddol.
	Cae'n-y-Coed -	Cae'n y coed isaf.
	Cae'n-y-Coed -	Cae'n y coed uchaf.
	Onen -	Yr Onen.
	Tal-y-llyn -	Tallin.
	Pen-y-bryn-pwll-du -	Pen-bryn pwll du.
	Muriau'r-gwyddil -	Muriau'r Gwyddil.
	Nant-ddu -	Nant ddu.
	Pen-y-Clipiau -	Pen y clipiau.
	Clipiau-Bâch -	Clipiau bach.
XI. S.W. (4.)	Pandy'r-ddwyrhyd -	Pandy'r Ddwyrhyd.
	Hendre-henydd -	Hendre hen-yd.

5579. (*Mr. Roby.*) Is your spelling the ordinary spelling or the phonetic spelling?—Where the literary form is certain, I put that down; where the literary form is uncertain, I have put the phonetic spelling. Now take the first instance, "Ogof-llechwen." "Ogof" means a cave, and "llechwen" is a white slate; while "Llochwyn" is a proper name and should be written with a capital letter.

5580. (*Chairman.*) In this case it is not a white slate?—No; it is a cave; and the whole word means "a cave belonging to a person of the name of Llochwyn." Then with regard to the name Hendre-gwen-lyffaint. "Hendre" means an old habitation "Gwen" in a proper name; and "lyffaint" signifies "frogs," so that the meaning of the name as now printed is "the old habitation of Gwen of the frogs"; but the real name is "Hendre of Gwen-llian," Gwen-llian being a Welsh proper name.

5581. And that is how it is locally known?—Certainly. In the case of Hendre-gwen-lyffaint, I found that no such name was known, and that Hendre Gwennlian was the name used in the locality. In the case of every name which I thought was wrong I went and consulted the people of the locality.

5582. That is a fine instance of the person who corrected the names being a little too learned?—Yes, I should think so. Then you have "Bron-miriant." It should be Brom-meirion. The name is that of a house which was built a few years ago. "Meirion" is the Welsh name for Merionethshire. The house faces Merionethshire, and the meaning of "Bron Meirion" is "The Breast of Merioneth." In "Rhyd-y-gyffiniau," the "g" in the last word should be a "c." Then you have "Cae'r-golen," the "field of light." It should be "Cae'r-gorlan," "the field of the sheep-fold"; there is an old sheep-fold in the field. Then "Hafod-y-fynydd" should be "Hafod y mynydd"; the correct Welsh form being "m" and not "f." Then you have "Cae-valley" which should be "Cae Fali"; the Welsh "Cae" and the English "valley" should not go together. The meaning is "Mary's Field." There is no sense in putting the English word "valley" there at all. Then you have "criau" which should be "crenau." You will find in that sheet you have the correct form also; you have the two forms.

5583. (*Mr. Roby.*) How do you pronounce "an"?—(*The witness pronounced it several times.*) "Bron-turnol" should be "Bron Turnor," that being the Welsh for the English name of Turner.

5584. (*Chairman.*) In the next, "Glan-Gwilym," which you say should be "Glan William," is not "Gwilym" the Welsh form of William?—Yes, but he was an Englishman. It is named after Mr. William Oakley, a nephew of Sir Charles Oakley, who built the house. It was not called by the name of "Glan Gwilym" at all; probably Mrs. Rowland may have corrected that. Then "Llechryd" should be "Llechrd," and "Rhoslyn" should be two words "Rhos llyn."

5585. But generally the names on this sheet are right?—Yes, I believe with these exceptions. I helped the Ordnance men as far as I could. They used to come to me very often, because there was not a single Welshman on the group. I did all I could for them. These were altered after they left my hands by Mrs. Rowland.

5586. (*Lieut.-Gen. Cooke.*) Then you are correcting these names entirely by local knowledge; how have you spelt the names in relation to pronunciation?—I have adopted the literary form as far as it is quite certain, and when not certain of that, the way they are pronounced.

5587. (*Chairman.*) The errors in the next sheet (XI. N.W.) appear to be of the same kind?—The errors there are very bad ones. You have "Tan-tŷ"; that is "under the house," when really it is the fulling mill "Pandy," it is close to the factory. "Bewdy-newydd" should be "Bendy newydd"; that is the new cow-house. Then "Ogofordronwy" should be "Ogo' Ronwy," which is a contraction of "Ogof Goronwy," "Goronwy" being a proper name and "Ogof" a cave, as we have had before.

5588. (*Mr. Roby.*) Your spellings are the proper and ordinary spellings; they are not altered to suit the etymology?—No, I object to that in all cases. Then in "Pant-y-mewydd" you have a "w" inserted in place of a "u."

5589. (*Chairman.*) Do you suppose that is Mrs. Rowland again?—It may be Mrs. Rowland or the engravers; I should not like to say which. Then you have "Coed Cae-valley" for "Coed Cae Fali." I have pointed out that mistake in another case. The difference in sound is not very great, and it is an error into which an Englishman would fall very easily indeed.

5590. Your "f" is a "v"?—Yes, always.

5591. I think we will not go through all these names; "Tal-y-llyn" you say ought to be "Tallin"?—Tal-y-llyn is the way in which some local philologist explained it. I really do not know what "Tallin" means. It cannot be "Tal-y-llyn" because it is not near the lake. The way in which the word is pronounced is "Tallin."

5592. It has nothing to do with "Tal-y-llyn"?—I do not think it has.

5593. What is the meaning of "Tal-y-llyn"?—It is the head of the lake. In the case of a person "tal" is the brow—"the brow of the lake."

5594. (*Lieut.-Gen. Cooke.*) Are these names you have seen written?—There can be no doubt about these Welsh names with the exception of "Tallin."

5595. Are these names you have seen, written in farm leases or anything of that sort?—I have seen many farm leases and I would not think of going to them for spelling at all.

5596. (*Mr. Roby.*) Have you seen them in newspapers?—Yes; and I have given the way in which they are generally spelt by Welshmen.

5597. (*Lieut.-Gen. Cooke.*) What I wanted to know was whether you are going entirely by oral evidence or by what you have seen in writing?—I go by both; but I have not examined many documents. The documents I have examined are often very badly spelled.

5598. (*Mr. Roby.*) Have you seen these words printed?—Yes.

5599. I think what General Cooke meant to ask you was whether you have taken the word as you have seen it in print or whether you have constructed it from the sound?—I have seen all these words with the exception of Tallin.

5600. (*Lieut.-Gen. Cooke.*) Some you have seen, some you have not?—I have seen almost all of them. Then there are other mistakes, "Glan-ddol" for "Blaen ddol." "Glan-ddol" means the "bank" of the "meadow." It is always known as "Blaen ddol." Then you have two words "Cae 'n-y-coed, Cae'n y coed uchaf and Cae'n y coed isaf. One is known as the upper farm, and the other as the lower farm; in neither case is the distinction inserted. "Cae'n-y-coed" means "the field in the wood." Then with regard to "Nant du," "du" is masculine; it should be "Nant ddu." With regard to "Pandy'rddwyryd," "y Ddwyryd" is the name of a river, and should be written with a capital letter. On Sheet XI., N.E., you will find a very bad mistake. The Pen yr Allt Pisolitic Iron and Lead Works are inserted on the map as "Bwlch-y-plwm Slate Works disused." "Bwlch-y-plwm" is about a quarter of a mile away. There are iron works and lead works at Pen yr Allt, but they have never been worked for slate at all.

5601. (*Chairman.*) The man who took the names was wrongly informed?—He never asked anybody; he could not speak a word of Welsh, and nobody about could speak English. There is no person about the works who can speak English. There was not a single Welshman engaged on this work. Then you find they have put down as "manganese works" the disused copper works of Hafod Boeth. Then they have put down two levels on Gors Fawr, both of which have been worked extensively for lead, as slate works in each case.

5602. Those mistakes you imagine arise entirely from the ignorance of the surveyors?—Yes, because all the people about know that those works were respectively worked for copper and lead.

5603. Do not the people speak English?—In that locality they do not. There are only farmers there. I was there last week working a little at the geology, and I asked the people if they had seen the surveyors about. They said, "Yes." "Did they speak to you?" I asked. "No; they never spoke a word — never asked us anything."

There is an indiscriminate use of hyphens and capital letters in the place names on all the sheets I have examined. You will find sometimes two forms on the same sheet. In Sheet XI., S.E., "Pen-y-foel" and "Pen y Foel" occur; one with the hyphen, the other without. Then you have "Coed-y-trwyn" and "Coed y Fron;" errors of this class are numerous. I have drawn up the following examples:—

Sheet XI., S.E.	Pen-y-foel and Pen y Foel occur. Coed-y-trwyn and Coed y Fron.
" XI., N.W.	Gelli-gôch and Morfa Du.
" XI., N.E.	Bryn-Dwryd and Pont Llechryd (Llechrwd).
Sheet IV., S.W.	Cae-du is inserted for Cae du. Cae-elyd is inserted for Cae clyd. Fron-las is inserted for Fron las. Rhiw-las (correct).
" IV., S.E.	Ffridd graig is inserted for Ffridd-graig.

5604. You heard the evidence of the last witness?—Yes.

5605. (*Lieut.-Gen. Cooke.*) Did you agree with the last witness?—Not altogether. I do not believe in one Welsh scholar having to settle all the names, because it is hard to find a Welsh scholar without his fads. Then these are omissions:—

OMISSIONS.

Sheet XI., N.E.	Hafod boeth. Y Gysgfa.
" XI., S.E.	Bedd Dori (Dorothy's grave).

As would naturally be expected, the omissions are most numerous in the thinly inhabited, mountainous districts, *e.g.*, the Aronig district, as may be seen from the following list:—

OMISSIONS FROM

Sheet XIII., S.W.	Nant goch. Creigiau Ednyfed. Rhydau gloewon. Nant y Crethyll. Cors ysgog. Cop y siol (ruins). Y Waen goch. Yr Orsedd (ruins). Nant Cist feen. Trinant. Cerig y pryfed.
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OMISSIONS FROM—continued.

Sheet XIII., S.E.	Ynys goediog. Twr yr eryr. Bryn y dyfrgi. Sindde ddu. Y Castell. Y Graig wen. Tyn y Graig. Ceunant y gareg ddu. Hafotty esgair (ruins). Pen y gob (ruins).
Sheet XXI., N.W.	

5606. (*Chairman.*) What do you attribute that to?—I do not suppose anybody was asked about them. That district is of great geological interest, and it is one about which information could easily be obtained. It would be difficult to direct any geologist to places in the district without the names. These are names which are very well known to anybody in that district.

5607. You say the same as the last witness, that the names of streams are deficient?—Yes. Then these are my suggestions as to revision, should such be considered necessary:—

i. "That an intelligent person, thoroughly conversant with the Welsh language, be employed with each group of surveyors, or for each district." I do not agree with the previous witness, because take those two forms "Nant l'trefor" and "Nant yr efail," both are correct, and a man living at a distance could not possibly know whether that should be Nant Trefor or Nant yr efail, but it is invariably known as Nant yr efail.

5608. (*Lieut.-Gen. Cooke.*) He must have local knowledge?—Yes.

5609. (*Mr. Roby.*) There would be no difficulty in writing down to see what the name should be?—No, but the other method would be more reliable.

5610. Is Mrs. Rowland alive now?—She is. I did complain before the names were printed, but something was said as to the disendowment of a widow lady, and nothing was done. I thought it was a pity not to have the names correctly done at the time.

5611. (*Sir A. Geikie.*) Do you think you would be at all likely to get half-a-dozen Welsh scholars to agree as to the proper spelling of these names?—Yes; a great many more, with the exception of a very few words. We have some words which are masculine in North Wales and feminine in South Wales, &c. I have seen Mr. Rowland's grammar and found it very useful, and have taught Welsh to others from it.

I will now continue with my suggestions:—

i. That an intelligent person, thoroughly conversant with the Welsh language, be employed with each group of surveyors, or for each district, whose simple duty will consist of collecting place names — not omitting field names, ruins of dwelling-houses, &c., which have been included with others as consolidated holdings, *e.g.*, Cop y siol, yr Orsedd, and Hafotty esgair now forming part of Annodd Wen farm; Tynygraig forming part of Amnodd bwl. Field names often throw considerable light on the old land customs, and the insertion of names of ruined dwelling-houses may be of considerable historical and social interest."

ii. That the person (or persons) so appointed be authorised to employ shepherds or other old inhabitants in each district to accompany him (or them) so as to get the place-names as complete as possible. I believe that was done with the old 1-inch maps, but there is nothing of the kind now.

iii. That the words be written in the literary form, wherever the form of the word is quite certain, but where any doubt whatever exists, the name should be written phonetically, without any attempt at rationalising, as has been the case with Tal-y-llyn for Tallin, and Bryniau Mawlle for Brynian 'r fonllef.

iv. There is, I fear, no society at present in existence in the principality which could undertake the revision of the place names. This would be foreign to the object of the Welsh "Cymdeithas Llafar Gwlad."

We have certain provincialisms; for instance, Ciarag for Careg; every Welshman knows that is wrong, and would not think of inserting it on a map in that form; and I would suggest that a person well qualified to do the work be appointed for each district, rather than one Welsh scholar for the whole of Wales. In this connexion I would name:—

Mr. A. N. Palmer for the Wrexham district, Professor J. M. Jones, for the Anglesey district, Professor J. E. Lloyd for the Caerarvon district, and Professor Williams Lampeter for the Cardigan district, &c. &c.

Mr. G. J.
Williams,
F.G.S.

20 July 1892.

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F.G.S.

20 July 1892.

I think that would be a more efficient way of getting the work done than by appointing one man only.

5612. You think a suitable person could be got in each county?—Yes. I also think that each person appointed should be supplied with a little memorandum as to general principles. The Professors of Welsh in the Welsh University Colleges, together with Professor Rhys, Reverend D. Silvan Evans, and Mr. Gwenogfryn Evans, might decide upon the principles on which to proceed, the persons selected for the work in each district, and be consulted while the work is progressing in case of necessity; because there may be some Welsh names with reference to which it would be well to consult Welsh scholars; but I think these are very few indeed.

5613. With regard to the suggestion you made before, that every surveying party should be accompanied by a person acquainted with Welsh, do you think it would be possible in each district to get hold of a local man with sufficient knowledge to attend the surveyors?—Yes, I should think so.

5614. (Mr. Roby.) I should think it essential that something of the kind should be done. (Chairman.) I was asking whether it would be practicable?—It is essential that the persons employed by the Survey should be attended by some one who has a knowledge of Welsh.

5615. Who would be a means of communication and also able to give information to the surveyors?—Yes.

5616. (Sir A. Geikie.) He should also have good local knowledge?—Yes.

5617. (Chairman.) If the persons conducting the survey had been able to talk to the shepherds they would not have fallen into the error of describing manganese works as slate works?—No; for instance, when I have been at work in the mountains I have hardly ever been out for a day without meeting shepherds. If a man was out in the mountains for two or three days, he would soon be able to get information as to the proper names.

5618. Are you of opinion that the errors of place names in the Welsh map are so considerable that every sheet ought to be gone over again and corrected?—Every sheet I know of ought to, but I have seen some sheets of Montgomeryshire which are more correctly done by a long way than others. I inquired who were the men engaged in that survey, and I was told that a Welshman named Davies from Bala was on the survey in that district and he corrected the names; in the neighbourhood of Machynlleth and Llanfrynmaur, the names are much more correctly written than on some of our maps.

As I have also been invited to offer any criticism or suggestions on the subject of the Welsh maps, I beg to make the following suggestions:—

i. That the contour lines be continued to the mountain tops, and not, as is the case at present, to a height of 1,000 feet. In the Festiniog slate quarrying district the 1,000 feet contour line lies below the lowermost slate zone in the district.

5618a. So that it is of no use?—No use whatever.

This would

(a) Give a better idea of hill forms, and avoid the necessity of the very dark shading sometimes used at present on the 1-inch map.

5618b. You do not like hill-shading?—I do not like the shading so deep as it is in some places. Take this instance: although it is very darkly shaded it gives you no idea of the contour of the ground; you cannot trace the contour lines.

(b) Be of great assistance in the working out of geological sections, relief maps, or models of the district.

(c) Continuously show the amount of vertical throw of geological faults.

I may mention another advantage from the contouring in which I think Sir Archibald Geikie will bear me out. We have geological faults of about 2,000 feet in the district, and it would be of considerable assistance in slate quarrying if the contour lines were continued right up to the top of the hills.

5619. That would show the faults?—You could show the vertical throw of the faults if you had contour lines.

5620. You mean on another map?—A geologist could show it.

5621. You do not mean that it could be shown on this map?—Yes, on this map geologically coloured; we have

quarries which instead of being on a line owing to a series of faults form now a sort of horse-shoe shape, and I thought myself that the contouring there would be of considerable assistance.

5622. Would contour lines of 200 feet do after 1,000 feet?—I should recommend going up at the present rate to the top.

5623. (Mr. Roby.) At what interval?—I should say 100 feet.

5624. (Chairman.) They are every 100 feet now up to 1,000 feet, where they stop?—Yes.

5625. It has been suggested to us that the hills should be contoured every 25 feet up to 500 feet, and every 50 feet after that up to 1,000 feet, and after that at every 250 feet?—I think it would really be of very little use to show contours at every 200 feet or 250 feet.

5626. The reason for the greater intervals at the higher altitudes is that when you get over 1,000 feet the ground is generally so accentuated that the contours would not be very far apart. (Mr. Roby.) That is not so with the hills in Wales; they go gradually creeping up?—There are exceptions as in the case of the Glyder, in Carnarvonshire. Generally speaking I should recommend contours every 100 feet.

ii. That the contour lines be shown in a different way from that employed at present, say, by a line of some other colour than black. The contour lines could thus be more readily distinguished from footpaths, and could be more easily recognised where the shading is deep." (See Sheet XI., S.W., north-west corner.)

You will notice there that the engraving is very dark.

iii. That rocks and prominent features on the ground, and small streams, be shown with more minuteness and accuracy than has been the case, e.g., near Llyn y dywarchen, Arenig Bach, and Trinant.

I think that conspicuous features on the ground should be put on the map. Such things could be very easily shown.

5627. (Sir A. Geikie.) You refer now to the 6-inch?—I refer now to the 6-inch. I think there should be something to show the bosses of rocks.

5628. (Chairman.) This map (a map handed in by witness) shows the rocks?—That is a case in point; that is my working map. The rocks I have inserted here are conspicuous on the surface. I think there should be a mark to show those.

5629. (Lieut.-Gen. Cooke.) Are those rocks part of a chain of hills, or are they rocks by themselves?—They are rocks by themselves cropping up out of the moorland.

5630. (Chairman.) They are much more distinct than a house would be?—Yes, much; some mark should be put where there is a conspicuous rock.

5631. I think if we survey isolated trees we should survey rocks?—I think so.

5632. (Sir A. Geikie.) You do not survey accurately isolated trees?—Yes, always.

5633. (Chairman.) Major Johnston says that the rule is that isolated rocks should be surveyed, but that in wild and mountainous districts it would hardly be considered necessary to survey every rock?—They are not done; that is all I can say.

5634. (Mr. Roby.) Are there a great many of those rocks?—No, not very many. If there were very many small rocks I should not expect them to be mapped, but they are quite conspicuous on the moorland.

5635. (Sir A. Geikie.) Is that the only example of defects you have found?—There are many streams and rocks not marked, and others not accurately mapped.

5636. This occurs in wild and desolate parts?—I can give you an instance. "A surveyor came to me when there was 2 or 3 feet of snow on the mountain tops, and he asked me, "Can you tell me from what direction this stream comes?" and I said, "No, I cannot." Then he said, "I have nothing to do but "to write to Southampton and tell them I cannot "trace it till the snow clears." I told him I thought that was the best thing he could do. The answer he got was that snow or no snow he must get it down, as they were wanting to get the work done, so he put it down as near as he could. There were other geologists with me on the ground; we failed to trace the stream as shown on the map.

5637. (*Chairman.*) But generally speaking, are the streams properly shown?—Yes. I have a sheet of my own here in which some streams are not shown; but I think every stream should be shown on the 6-inch.

5638. No doubt they should be?—But they are not.

5639. (*Mr. Roby.*) Your streams are pretty constant in Wales, are they not?—Yes.

5640. They are not created afresh every winter in different places?—No.

5641. (*Chairman.*) Will you look at this sheet (Sheet 11, Merioneth); do you know these streams?—Yes; as far as I know those are correct; but I would not swear. I can identify many of those streams.

5642. Can you detect any omissions?—I detect no omissions in that. There is one in which I have had some interest of late, which is omitted. I cannot lay my finger upon the sheet now. There are pools in that stream which I could not jump over last week. There are several small streams omitted.

5643. Could you identify the sheet?—(This was done by the witness). It is Sheet 13, Merioneth. In very

high ground I find that both the names of the streams and the streams themselves are omitted:—

My last suggestion is:

iv. That in the case of trial levels, disused workings, &c., the nature of such workings, e.g., copper, lead, slate, &c., be inserted, whenever trustworthy information can be obtained as to their nature.

That has not been done.

5644. They are entered, but they are occasionally wrong?—They are entered, and they are often wrong. Information as to them can be easily obtained. In the Llanfrothen district they have worked for copper. There are several levels down, but the nature of the workings is not indicated.

5645. The difficulty is to see that the names are properly checked?—I have no doubt there is a difficulty, but for myself I think it would be far better done by more than one man. It really requires some local knowledge. I should suggest one man for each county.

The witness withdrew.

Adjourned until to-morrow (July 21) at 11.30.

Board of Agriculture, 3, St. James's Square, S.W.

SIXTEENTH DAY.

Thursday, 21st July 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. HENRY JOHN ROBY, M.P.
Mr. CHARLES FORTESCUE BRICKDALE.
Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Colonel Sir CHARLES WILSON, K.C.B. &c., &c., Director-General of the Ordnance Survey, re-called.

5646. (*Chairman.*) Have you looked over the evidence which we have been receiving?—I have read all the evidence which has been sent to me,—up to the 13th day.

5647. Do you generally agree with it or do you not?—I agree with much of it. There are several statements, which I think have been made under a misapprehension, or through a misunderstanding, that I should like to have an opportunity of correcting.

5648. Would you like to correct them now, or would you like to put in your answers in writing?—I should prefer to put in my answers in writing. (See Memo. by Director-General on Alleged Errors, p. 218).

5649. We shall be obliged if you will do so, and we will make that part of our evidence. Is there anything you would like to say to us now on the evidence verbally?—I do not think there is anything that I could not answer better in writing.

5650. You stated you thought it might be desirable to separate the revision of the 1-inch map from that of the larger scales; how would you propose to arrange your staff so as to carry that out?—There are at present several men employed, in the field, and in the office, on the preparation of the 1-inch map for the engravers, and I propose to add to their number and to form them into a revision section of the Survey.

5651. Employed exclusively on the 1-inch map?—Dealing exclusively with the 1-inch map.

5652. The engraving staff and drawing staff in the office would be common, I suppose?—The drawing staff in the office would be solely employed on the revision of the 1-inch.

5653. Would it be possible to estimate separately every year for the revision of the 1-inch map, including both the survey in the field and the work in the office,

so that it might be a distinct Vote of Parliament?—I think the cost of revising the 1-inch map after it has once been brought up to date will be very trifling. I do not think that the estimate I previously gave will be greatly exceeded; but it depends very much upon the time in which you wish to have the revision completed.

5654. I think that sum was between 1,500*l.* and 2,000*l.*?—About 2,000*l.* a year in addition to the present expenditure.

5655. Is not the present expenditure nil?—I think I have stated that the present expenditure on the examination of the 1-inch map is about 1,500*l.* After the map has once been brought up to date I do not think the field expenditure will be more than 1,000*l.* a year.

5656. (*Mr. Roby.*) In how many years do you think you can bring it up to date?—In about five years.

5657. For an expenditure of 3,500*l.* a year you could bring it up to date in five years?—Yes.

5658. And after that it would only cost 1,500*l.* a year to keep it right?—If certain arrangements which I would venture to propose were carried into effect. I should like with reference to the revision of the 1-inch map to bring before the Committee these drawings. The Committee will remember that the revision of England was only authorised in December 1886, so that no revision of the 1-inch map could have been undertaken before that date. In Ireland the revision has been authorised for a great many years, and there the revision of the 1-inch has followed the revision of the 6-inch map. I have brought two Irish sheets to show the Committee the extent of the alterations. (*Witness explained the alterations to the Committee.*) This is a copy of the revised sheet.

Mr. G. J. Williams, F.G.S.

20 July 1892

Col. Sir C. Wilson, K.C.B.

21 July 1892.

Col.
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K.C.B.

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5659. (*Lieut.-Gen. Cooke.*) Does this represent one year's revision?—No, several years. We have been preparing a special map of the Chatham district for the War Office, and this shows the amount of alteration in a part of the country which has been much altered; there is not an additional main road since the Survey was made 25 or 30 years ago.

5660. (*Chairman.*) This was published in 1883?—The Survey would then be about 15 years old. Excepting near Southend, there is practically no new road.

5661. (*Mr. Roby.*) There has been a good deal of building, I suppose?—Oh, yes.

5662. (*Chairman.*) It is shown here?—Yes. With the exception of one or two branch roads there is hardly a new road.

5663. This is the new 1-inch map which is under revision; this is not the old 1-inch map?—No; this is the new 1-inch map.

5664. (*Mr. Roby.*) When was the original survey?—25 or 30 years ago.

5665. What date does the map now represent?—To-day. That has been revised during the last two months for the War Office.

5666. By a recent survey made by your men on to the ground?—We sent our men to the ground. This is another sheet (Christchurch) which was published some years ago, and has been revised. This sheet had been completed to the County Boundary, and to bring the two sections of the sheet into harmony I had the Hampshire portion revised. It is perhaps the heaviest revision there would be in England. If you look at the country district you will see that there is no new road. I should like to have an opportunity of sending in a detailed estimate for the revision. I only received Major Johnston's note asking for an estimate yesterday, and have only had time to make a rough one, which comes to about the sum mentioned.

5667. (*Chairman.*) For the revision of the 1-inch map?—Yes.

5668. (*Lieut.-Gen. Cooke.*) You say you could revise it in five years with an annual expenditure of 3,500*l.*; could you revise it in two and a half years with an annual expenditure of 7,000*l.*?—I should like to consider that.

5669. I mean could you accelerate the revision if necessary?—We could accelerate it, but acceleration means additional expense. I understood that the view of the Committee was that the revised 1-inch map should be completed by the end of 1896. (Appendix B, see Report, p. xli.)

5670. (*Chairman.*) I understand that acceleration would be practicable. What would be the increased cost of it?—I will have an estimate made out.

5671. (*Lieut.-Gen. Cooke.*) I see the outline engraved map is to be completed in 1896?—Yes.

5672. And after that you think that for 1,000*l.* a year you would always be able to keep maps in a condition for sale, revised nearly up to date?—If certain arrangements were made which I was about to suggest to the Committee.

5673. (*Chairman.*) What is the nature of these arrangements?—I would propose that after the 1-inch map is brought up to date, it should be revised annually as far as regards railroads, roads, canals, docks, and town extensions. With regard to railroads, we receive annually from the Board of Trade notice of the railroads that have been opened during the year, and we then send men to the ground to insert them on the map. There is thus no difficulty in keeping the railroads up to date. With regard to new roads, I would suggest some arrangement with the county councils, such as, I think, you yourself suggested to Mr. Chaplin. If that were done we should know when new roads were opened, just as we now know when new railroads are opened, and we should deal with them in the same way. I do not know who is the sanctioning authority with regard to canals.

5674. A canal, of course, must be under an Act of Parliament, and I suppose a dock could not be constructed without the urban authority knowing something about it?—I suggest that notice of new works of this kind be sent to the Ordnance Survey Department in the same way as the notices of new railways.

5675. If a dock is authorised by Act of Parliament, of course the Board of Trade could inform you?—Of course they could give us notice, and with regard to town extensions, the suggestion I made in my evidence

was that borough surveyors should send to the Department each year a map, showing where there had been improvements. If we knew what works of that kind had been executed during the year, we could put them on the engraved plates in the following year.

5676. (*Lieut.-Gen. Cooke.*) And that you think would keep the plates accurate for practical purposes?—That would keep the plates practically accurate. According to information I have received with regard to the Prussian staff maps, the kingdom of Prussia is divided into districts (*Kreise*) which have an average area of 20 German square miles. For each district there is a portfolio in which sheets of the general staff map of the district, mounted on linen, are kept. Where there is a map on the 1/25,000 scale—the scale of the general staff map is 1/100,000—the sheets of that map are kept in the portfolio. The districts are obliged to insert all important alterations, especially those relating to the network of main roads, accurately upon their maps, in red colour, and to send the portfolios with the maps once a year to the Ministry of Public Works, which transmits them to the Cartographical (publication) Section of the Survey Department for information. The Cartographical Section transfers the alterations to its own maps, which then serve as models, from which the original stones and copper plates are revised. Large alterations are not engraved on the original plates without further examination. In these cases a surveyor is sent to the district by the Survey Department to examine the sheets on the ground, and see whether the alterations have been inserted with mathematical accuracy. Only after this examination, and correction when necessary, are the alterations engraved on the original plates. In the same way the smaller German States send their portfolios with the revised maps once a year to the Cartographical Section. The Cartographical Section, after making the alterations, sends the portfolios back direct to the districts and States. The accuracy of these corrections depends entirely upon the qualifications of the district surveyors, who I believe have to pass a certain examination before they are appointed.

5677. (*Chairman.*) Except in the case of a large alteration does the Cartographical Department of the State send an officer specially down?—They send an officer specially down, if the alteration is of importance.

5678. That would be very much akin to what we are suggesting or trying to suggest?—Very much; the feature of the German system is the transmission of the maps in portfolios to the districts.

5679. They send their original map apparently?—They send their original map. These maps are kept and altered from time to time; but the arrangement I suggest with regard to the acquisition of information from the different public departments would give the same results as the German system.

5680. That is to say, that they should make a tracing or a copy?—That they should send us information with regard to railways, roads, canals, and docks. We should then survey and insert them on the map.

5681. With regard to publication, would you print very small editions in order to enable your maps for sale always to be printed from your last plates?—We never print editions of the 1-inch map; we print to meet the demand.

5682. What do you print—100 copies?—We print according to the way in which the sheet sells. The orders are that when the stock in store reaches a certain minimum, more copies are to be printed.

5683. What does "more" mean—100 copies or 10 copies?—It depends entirely on the sale of the sheet. If we found that a sheet was selling very quickly we should print as many as 150 or 200 copies. If we found that the sale of the first printing had extended over a long time we should print a smaller number; there is no difficulty as regards stock in the case of the 1-inch.

5684. You think that in the case of the 1-inch there is never any large amount of stock?—No, there is no large amount of stock in the case of the 1-inch.

5685. Do you see your way to producing a cheap map in colour on cheap paper as suggested in the report of the Military Committee?—I do not think we can produce a cheap map in colour, considering the heavy work connected with the publication of the 25-inch and the town maps, without increasing our plant; and there would have to be an addition to the Vote for that particular purpose.

5686. You would rather suggest that if a map in colour is wanted arrangements should be made for its publication by private mapsellers?—I think any map of that kind should be produced by the trade; and that the Ordnance Survey Department should confine itself to the production of coloured maps demanded by the War Office.

5687. If coloured maps are demanded by the War Office, there is no reason why they should not be sold?—There is no reason why they should not be sold, but they would not form a coloured map of the whole country.

5688. Only portions. (Lieut.-Gen. Cooke.) Do you know what proportion of the country the Military Committee contemplate having on the coloured map?—I think the view of the Military Committee was that we should begin by making experiments in colour printing, and should commence with the south-eastern counties which are the most important from a military point of view.

5689. But they must contemplate extending it over the whole country eventually and not merely confining it to the military districts?—I think that would very much depend upon the way in which the map was received.

5690. It was suggested that there should be an edition, by which I think the whole of England was meant?—The Military Committee no doubt had in contemplation a coloured map of the whole of England, but the first sheets were to be experimental to see how they were received.

5691. Do you think that the standard 1-inch map with hills should have hills and contours in brown, or should the whole be black?—I think that it might be printed, as far as we can do it, in two forms, one with the hills in black and the other with the hills in brown, until we ascertain the taste of the public.

5692. You see no difficulty in producing it in these two forms?—Not at all in the sheets that are now being engraved. In the old sheets we should have a difficulty.

5693. Because you have only one plate?—Because we have only one plate. Your secretary asked that some experiments should be tried in printing on Japanese paper, and I have brought up some specimens printed on three classes of Japanese paper. That sheet is double printed in black. We had no colour ready, and I was unable to have it printed in brown; but I don't think brown would go well with this paper.

5694. This is Japanese paper?—This is the same map printed on Japanese paper of three different textures.

5695. Are these made in Japan?—I do not know. (Secretary.) It is the same paper that the French *carte vicinale* is printed on.

5696. This is very tough?—(Sir C. Wilson.) Yes. This is double printed from two plates, one printed over the other, and I think the paper gives a very beautiful result.

5697. (Lieut.-Gen. Cooke.) Exceedingly soft?—Very good indeed.

5698. The objection to the paper is that it will not stand damp?—It will not stand wet.

This is another print from one of the old plates with the hills engraved on the outline plate. That plate you can print in any colour but with this it would be more difficult. (Witness produced other specimens of maps printed on Japanese paper.)

5699. (Lieut.-Gen. Cooke.) Does it injure the plate?—The printers like the paper. If you hold the paper up to the light you will see that it is curiously blatched.

5700. (Chairman.) Is that because the thickness of the paper is uneven?—I think it is due to the colouring matter.

5701. I must say I do not see any reason for changing unless it be to effect economy?—(Secretary.) I think the original suggestion was for a separate edition on this paper. I do not think it was ever proposed to substitute Japanese for the present paper. (Witness.) These are advance editions on the different kinds of Japanese paper.

5702. (Chairman.) There is evidently no difficulty in printing them on thin paper?—There is no difficulty. The only question is the kind of paper that should be used.

5703. Our evidence is conclusively in favour of strong paper, and the only object of printing on thin paper would be to suit some people's views. Then you get the inconvenience of two editions?—I think one proof that thin paper editions are not necessary is that we have never had any demand for them. Several officers are very much in favour of thin paper, but we have never had any general demand for thin paper impressions, therefore we have not printed them.

5704. (Lieut.-Gen. Cooke.) I do not think the public know how to make demands. An extraordinary ignorance prevails with reference to the Department. (Chairman.) Do you recommend any other paper and the contours; you have told us about the 1-inch map; do you see any difficulty in giving the contours on the 6-inch map in brown?—It is simply a question of expense.

5705. Would it be serious?—I do not think we could sell the 6-inch sheet for the same price with the contours in colour.

5706. What do you suppose you would have to add to the cost of the sheets?—The price of the maps is so much connected with the charge for agency that I do not think we could sell the coloured sheet under 1s. 6d.

5707. It would add 6d. to the cost?—Yes, per quarter sheet.

5708. (Lieut.-Gen. Cooke.) The whole additional expense would be in the double printing, I suppose?—The double printing.

5709. That would be all?—Yes.

5710. Would that cost as much as 6d. in the long agency?—If you pay over the 6d. for the 1-inch map sheet you will have to increase the agency. In a shilling map the agent gets 4d. and in a 1s. 6d. map he gets 6d.

5711. (Chairman.) In fact, the agent would get the benefit of the additional cost of the map?—To a certain extent.

5712. If that could be got over the actual addition to the cost would be very trifling?—Comparatively trifling.

5713. Would one penny cover it?—1s. 6d. would cover it well.

5714. I said 1d. in addition?—It depends entirely upon the size of the edition. If we were to print an edition of 600 or 700 it would cover the cost very easily.

5715. (Lieut.-Gen. Cooke.) But you would not throw into the cost, would you, the cost of preparing the second plate?—No.

5716. It would be merely the "pulling"—the printing?—The pulling.

5717. How many do the printers pull in a day. Is it not about 100?—That is on the hand-press; in the steam-press they would print very many more, but if we were to print large editions in colour we should have to introduce another steam-press better adapted to that description of work.

5718. (Chairman.) The price of 1s. 6d. would be prohibitive of the sale of 6-inch maps?—My answer referred to the hills in brown and to the contours. The selling price might be fixed at a shilling.

5719. (Lieut.-Gen. Cooke.) I should like to ask you one question about the hill-shaded map. Do you think that under any circumstances it would be advisable to give up the present hill-engraved map in its present form?—Certainly not. I think it would be a very great misfortune if the engraved map—which is certainly, with the exception of Dufour's map of Switzerland, the best hill-engraving in Europe—were given up now that it is so nearly complete.

5720. Even supposing that the experiments in doing hills in other forms were to succeed, you would still recommend that the 1-inch map should be completed in its present form?—Certainly; I think it would be a very great misfortune if it were given up. I know of only one map which has been published which is superior to ours as a work of art, and that is Dufour's map of Switzerland, upon which the style of our map is to a great extent based.

5721. (Mr. Baskdale.) Dufour's map is the present Government map?—Dufour's map is an old map, and it is the most beautiful specimen of hill-engraving that has been published. Of course in Switzerland

Col.
Sir C. Wilson,
K.C.B.

21 July 1892.

Col.
Sir C. Wilson,
K.C.B.
21 July 1892.

the ground is very high, and lends itself to artistic treatment.

5721a. When will the engraved hill-shaded 1-inch maps of Scotland and Ireland be published?—That of Scotland will be completed in 1893 and that of Ireland in 1894.

5722. (Chairman.) I will come to the question of paper now. Is it possible to have a standard paper for Ordnance maps to be supplied by one firm of paper manufacturers, or do you think it possible to get paper of satisfactory colour and texture by tender in the open market?—I think it is impossible to have one standard paper for all maps. You must have a paper to suit each scale.

5723. In that I agree, but I mean a standard paper for each map?—I understood the question as meaning one paper for all map publications. That would be impossible, but for each scale I certainly think that it would be better to establish a standard paper, and to publish only upon that paper.

5724. And to have it specially manufactured by one firm?—There are two or three good firms that paper might be obtained from.

5725. You think that different firms might be depended upon to supply an absolutely similar paper if applied to do so?—I think there are two or three firms you might perfectly depend upon, and that it would be better to make a contract with one firm for a certain term of years, say, 10 or 15 years; that firm would then have an interest in making the special papers which our processes require.

5726. Do you think it would be desirable that the supply of paper should be absolutely in your own hands rather than having to depend upon the Stationery Office, first of all trying to find out what you want, and secondly trying to obtain it?—I think from the Survey point of view it would be desirable that the Director-General of the Survey should make arrangements with the paper dealers; but there are considerations which enter into the question besides the requirements of the Survey.

5727. So far as the requirements of the Survey are concerned you think it better that the Director-General himself should be responsible for the supply of the proper sort of paper?—I think so. I wish to say that the paper supplied to us now through the Stationery Office is satisfactory.

5728. For how long a time have you been satisfied?—For the last three or four years.

5729. The paper supplied has been equal in quality?—The paper recently supplied has been of good quality I have had a return made out of the papers used by the Department during the last few years.

5730. Are those qualities or quantities?—This is a return showing the maker, the weight per ream, the cost per ream, and the size of the paper; there are remarks showing the papers which were found unsatisfactory and which have been changed.

5731. How do you know the cost—the cost is paid by the Stationery Office?—I only know by private information from the Stationery Office.

5732. (Chairman.) There are evidently difficulties with regard to paper, and I understand you would like to have the control of the paper absolutely in your own hands?—I think that is desirable from the Survey point of view.

5733. (Lieut.-Gen. Cooke.) We have had great complaints that the different Survey papers do not match, and especially in the case of the 6-inch map, but I suppose you consider now that the conditions of the supply will make it impossible that any one map shall have two sorts of paper?—You cannot well use the same paper for printing from the engraved and from the zinc plates.

5734. Except where the engraved and the photo-zincographic sheets come into contact, are you satisfied that the paper on which any one class of maps is printed should be entirely uniform?—It should be entirely uniform.

5735. You are satisfied that that will be entirely the case?—Yes.

5736. (Chairman.) Can you give an estimate of the cost of putting on additional contours on the existing map as is proposed by certain witnesses, and also in the report of this Military Commission?—There are two methods of putting on the contours, one by adding instrumental contours, and the other by interpolating contours. The Military Committee, I

think, recommended that there should be instrumental contours, and that, if the Government would not add more instrumental contours, contours should be interpolated by staff officers; I do not know to which your question relates.

5737. I was referring to the instrumental contours which the Military Committee recommends. (Lieut.-Gen. Cooke.) That is at 25 feet, 75 feet, 150 feet, 250 feet, and 350 feet, that is, five additional contours?—It is extremely difficult to give any reliable estimate of the cost of contouring, because we never know until we go on to the ground what the length of the contours will be; but I have had the cost of some of the contouring taken out, and I find that for an average English county it was about 5*l.* per square mile. If the proposal of the Military Committee were carried out, that is to say, if additional contours up to 400 feet above the sea-level were added, I calculate that the cost would come to about 4*l.* per square mile.

5738. Additional?—4*l.* per square mile for running the additional contours up to 400 feet. That would cost about 160,000*l.* for England and 32,000*l.* for the cultivated districts of Scotland, but it is extremely difficult to give an accurate estimate.

5739. And supposing they were interpolated contours, would the cost be diminished by half?—I have had no experience and have no record of the cost of interpolating contours in Lancashire and Yorkshire, but I should say that it would not cost more than half. Some officers are now making experiments on two sheets, and we shall know, when they have finished, at what rate of progress the contouring can be carried on.

5740. (Chairman.) Are those interpolated?—Yes, interpolated.

5741. (Lieut.-Gen. Cooke.) When will you know that?—I should think we ought to know soon, as they have been at work some time.

5742. (Chairman.) Would you let us know that?—I will let you know as soon as I can. It is not yet quite settled how we should interpolate contours. Several methods have been suggested, and we should have to try experiments. The method that I should prefer would be by tachometer and plane-table, but I do not know whether that would be cheaper than running contours with a water-level. We should have to make a few experiments to see which would be the most economical.

5743. Do you know by what order the system of contouring adopted in the first 6-inch maps of Lancashire and Yorkshire was changed for the existing system, because we have seen the recommendation of what is called the "Contour Committee," and they say nothing about any abandonment of what was being then done?—I believe that change was made by Sir Henry James, but I cannot find anything in our records about it.

5744. That is to say, by the independent action of the Director-General of the Survey?—I think that must have been referred to higher authority. It was probably about the same time that the Treasury stopped the contouring in Ireland altogether, but I can find nothing in our records to show when it was done.

5745. Or why it was done?—Nor why it was done. I presume it was because of the great cost, and that it took place when the Treasury stopped the contouring in Ireland.

5746. But you can find no trace of the Treasury order?—There is no Treasury order that I can trace.

5747. (Mr. Prinrose.) When was the contouring in Ireland stopped?—3rd July 1857.

5748. (Chairman.) It would not have been in consequence of the recommendation of what is called the "Contouring Committee"?—Not a direct recommendation, but I think it was done in consequence of the views they expressed.

5749. (Lieut.-Gen. Cooke.) I suppose, in considering any other recommendations for additional contouring, that we might take this 4*l.* per square mile which you have given us as an available figure, proportioning the amount to the number of the contours?—Yes.

5750. (Chairman.) You have read, of course, the report of the Contour Committee, consisting of Lord Ellesmere, Mr. Brunel, General Sir J. Burgoyne, Sir Roderick Murchison, Mr. De la Beche, Mr. Lewis Gordon, and Mr. Rendell, and others, and that committee does not appear, I think, to make any recommendations as regards reduction of the contours. They say that the levels above described having been provided, contour

lines to a certain extent would be a useful addition to the map on the 6-inch scale at an outlay of 5s. per lineal mile; this being the cost of contouring as estimated by Captain Gosset, on the assumption that the levels above mentioned have been previously obtained and recorded. These contour lines should be instrumental, and traced with accuracy, and the system of interpolated contour lines they recommend should be abandoned. There you see they only estimate an expenditure of 5s. per lineal mile, which has been very largely exceeded?—That was very much under-estimated.

5751. So far as you know, there is no other recommendation or direction than that?—So far as I know, there is no other except the Treasury order that the contouring in Ireland was to be discontinued. I may add that the Treasury have since authorised the recommencement of contouring in Ireland.

5752. Do you propose to withdraw from sale all the first edition of the 6-inch map without contours, now that the second edition is published with contours?—As a matter of fact, the sale of the 6-inch map without contours has been authorised at 8d. a sheet. I think a great number of people in England do not understand contours, and they would quite as soon have the maps without contours as with them.

5753. You propose to exhaust that stock, and not replace it?—Not to replace it. I noticed in Mr. Stanford's evidence that he spoke of selling these sheets off as damaged goods; but I always understood that his great objection was that the diminution in the price diminished his profits, and that it was against the spirit of his contract to reduce the price of Ordnance maps, and also that he would have to incur a certain amount of outlay in getting the 6-inch sheets out of his drawers ready for the Stationery Office to stamp the reduced price upon them.

5754. You would not leave it optional then, to Mr. Stanford, to sell at 8d.; you would mark every sheet yourself to be sold at 8d.?—The sheets are at present marked at 1s., and what I proposed was, that the sheets should be stamped at 8d. at the cost of the Department, or rather at that of the Stationery Office.

5755. (*Lieut.-Gen. Cooke.*) Do you stamp them, or does the Stationery Office?—It was proposed that the Stationery Office should stamp them at Mr. Stanford's establishment, but Mr. Stanford objected to that. He said it would be a great expense to him to get the maps out of the drawers ready for the Stationery Office stamper, so that we have now come to an arrangement under which he sends the sheets down to us at his convenience, and we stamp them at Southampton.

5756. (*Chairman.*) Do you consider that is a necessary course to take. Would not an authorisation to Mr. Stanford to sell the uncountoured stock at 8d. be sufficient, knowing what the stock is?—I think that would have been misleading the public. I look upon the alteration in the price of the uncountoured sheets of the 6-inch as similar to the alteration in the price of the town maps, which took place some three or four years ago. In that case the price of the town maps was increased from 2s. to 2s. 6d., and all the impressions in Mr. Stanford's hands were stamped with the new price. It was then necessary to authorise Mr. Stanford, by stamping the maps, to sell at a higher price.

5757. But here no one would be damned except the Stationery Office if he sold at 8d. what is directed to be sold at 1s.?—I think it is always more satisfactory to have the selling price of maps stamped on them.

5758. I should not have thought it would have been worth the expense. A specimen case was brought before us of a change of pattern adopted in drawing a 6-inch map which rendered the sheets of the town of Gloucester unsightly when mounted together?—That was an accident, and I should like to explain how it occurred. The 6-inch sheets were originally published with all the houses in black; but I considered that that made the maps look very heavy and dark, and issued instructions that in future all towns were to be published hatched like the Birmingham map, which is very much lighter and prettier. The instructions were that when a new edition of any sheet was called for it was to be issued hatched instead of with the houses in black. In the case of a town which had not been hatched for the first edition, all the sheets should have been hatched at the same time, and the unhatched impressions destroyed. In this case, through an oversight, all the plates containing Gloucester were not hatched at the same time. If there had been a local

agent at Gloucester, he would have drawn our attention to the error, and we should have corrected it at once, but our attention was never called to it, and, unfortunately, it escaped notice. The proper course would have been to have issued the whole of the town hatched.

5759. In fact it was contrary to what was contemplated, that any part of one town should be left in one form while the other part was done in another form?—Quite contrary. It was a mistake which I believe has been corrected, and if our attention had been called to it we should have corrected it at once.

5760. The question of meridians has been brought before us. What expense would be involved if the revision of the whole country were drawn on a few meridians, in fact, on new meridians. The 1-inch is already on one meridian?—I notice that a great point has been made of the inconvenience arising from the different meridians. As the Committee may probably be aware, there were many changes in the scales for the Survey, and the view prevailed that the map of each parish and each county should be complete in itself. The result was that each county was drawn upon its own meridian. This system was continued until the inconvenience arising from the publication of partly filled sheets, only completed to the county boundary, was felt, and during the later years of the Survey as many counties as possible were drawn on the same meridian. I think you have a map showing the meridians. It is unfortunate that so many meridians have been used, but the question of altering them has been considered by myself several times, and I have come to the conclusion that the alteration is not worth the enormous sum that it would cost. If the meridians were altered you would have to re-score all the points and re-draw every 25-inch plan in the districts affected, and I estimate that if the meridians of half the country were altered the cost would be 630,000l. for the 25-inch map alone, and that for the 25-inch, the 6-inch, and the town maps, it would come to very nearly a million of money. I may add that, excepting by Mr. Crook, the differences of meridian have never, I think, been brought to my notice as a source of practical difficulty. Complaints have often been made that individual plans have not been filled up to the margin, but I have very rarely heard any complaint with regard to difference of meridian.

5761. Probably you have noticed that the engineer of the Lancashire, Cheshire, and East Coast Railway, Mr. Cooper, said he had crossed England from east to west without any difficulty arising?—I think that is a very good practical test. I may add that in Scotland, where we are putting or going to put the 6-inch counties on the 25-inch scale, and shall have consequently to draw the 25-inch plans, I have changed the meridians so as to make them coincide with the meridians of others.

5762. (*Lieut.-Gen. Cooke.*) You have diminished the number of meridians in fact?—I have diminished the number of meridians. It is always possible over a small area, where two counties join, to combine the adjoining sheets.

5763. (*Chairman.*) We tried that yesterday with Gloucestershire and Somersetshire, and I must say it did not appear to me as if there were any serious difficulty?—There is no very serious difficulty in combining the sheets of adjacent counties in that way.

5764. Can you tell us what amount of the Survey Vote is now being expended on the South Lancashire and Yorkshire belt of towns and the intervening country—the part, in fact, which is not yet published?—We are expending now about 70,000l. a year on Lancashire and Yorkshire. That will come to an end in 1893.

5765. (*Mr. Roby.*) Is that on the town scale or the 25-inch?—All scales.

5766. Can you separate it and say how much is the town scale?—I could not without reference to the returns. We can get out the cost of the town surveys and the 25-inch surveys in Lancashire and Yorkshire.

5767. (*Mr. Primrose.*) That is included in the 96,000l. which in your estimate of the current year is put down under the head of revision?—Yes.

5768. (*Chairman.*) Is that money spent locally or some of it in the office at Southampton?—Principally locally; some of it in the office at Southampton. By locally I mean that it is spent by the divisions.

5769. (*Lieut.-Gen. Cooke.*) That is the expenditure up to the production of the manuscript plan?—Yes.

Col.
Sir C. Wilson,
K.C.B.

21 July 1892.

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21 July 1892.

5770. (*Mr. Roby.*) Do you mean that 70,000*l.* would be for the whole of Lancashire and Yorkshire?—By the end of next year it will very nearly be finished; there may be a few small districts left.

5771. That will amount to two or three sums of 70,000*l.*?—Yes.

5772. (*Chairman.*) Is that exclusive of publication?—That is exclusive of publication.

5773. You may say that what is spent at Southampton at the office is mainly publication?—It is entirely publication except the examination of the plans as they come in from the divisions.

5774. So that out of 96,000*l.* spent on what is called "revision" and "survey" 70,000*l.* is now being spent in Lancashire and Yorkshire?—In Lancashire and Yorkshire.

5775. Irrespective of the cost of publication?—Yes.

5776. Then all the remainder of your divisions only spend 26,000*l.*?—The expenditure in England is 96,000*l.*

5777. Of that 96,000*l.*, 70,000*l.* is spent upon this Lancashire and Yorkshire belt, and the remainder is spent on the divisions in other parts of England?—The remainder is spent chiefly in the revision of London and of Plymouth and Glasgow.

5778. (*Mr. Roby.*) Large towns?—Large towns.

5779. (*Chairman.*) Can you tell us what is the average cost of the 1/500 scale, and can you compare it with the cost of the 1/2500 scale in the same locality?—The cost of surveying what we call a medium-town plan on the 1/500 scale is from 1*s.* to 2*s.* an acre, and of a medium agricultural plan on the 1/2500 scale about 1*s.* an acre, but I presume the question means what would be the cost of a 1/2500 plan containing nothing but town work, that is to say, of a town area of 25 large-scale plans. We have had no experience of that. We have never surveyed a large town area on the 1/2500 scale, but I suppose that the cost would be from 3*s.* to 4*s.* per acre.

5780. (*Lieut.-Gen. Cooke.*) You say the average cost of a town plan is from 1*s.* to 2*s.* an acre?—That is on the 1/500 scale.

5781. (*Chairman.*) The 10-foot scale costs about 1*l.* an acre?—It is very rarely so high as 1*l.*

5782. (*Lieut.-Gen. Cooke.*) The 1/2,500 is 1*s.*?—That is in the agricultural districts.

5783. What do you say is from 3*s.* to 4*s.* an acre?—That is what I estimate the cost of surveying a town like Lancaster or Liverpool on the 1/2500 scale would be.

5784. (*Chairman.*) Supposing it was separately surveyed?—Supposing it was separately surveyed.

5785-6. (*Lieut.-Gen. Cooke.*) That is one fifth of the cost of the town scale?—Yes.

(*Chairman.*) The cost of a town map is five times as much.

5787. (*Mr. Roby.*) How many acres are there in a sheet?—(*Secretary.*) 960 in a full 1/2500 scale sheet.

5788. (*Chairman.*) And the time involved, would that also be about five times as much?—I should think that would be about four or five times as much, but we have never surveyed any large-sized town on the 1/2500 scale. It is merely an estimate.

5789. (*Mr. Roby.*) In Lancashire you must have got to some places which would almost give you a standard for it?—The estimate of 3*s.* or 4*s.* is taken from some of our experience in the suburbs near Manchester. Of course that is different from a compact town because you can get round the blocks of houses quite easily.

5790. (*Chairman.*) When you get into compact towns it is more expensive than where you have a thinly inhabited district which has been lately opened up?—Yes.

5791. Then as to the provision of these town maps which has so greatly stopped the progress of the Ordnance Survey?—It has delayed the progress of the cadastral survey to a great extent; but the great difficulty that the Survey has, and will have to contend with to a greater extent in future, is the publication. It is not the actual survey on the ground that gives rise to difficulties, but the great expense of publication and the enormous number of plans that have to be published.

5792. You have now compared the cost of the survey. Can you compare the cost of publication in the same

way?—I have not made an estimate of that. It would have to be carefully prepared, and the cost of the the 1/2500 plans and of the 1/500 plans of the same area got out. (*See Appendix XV.*)

5793. I think it is very desirable that we should have that. I think that is a most important point. Then again there is the time involved. You have got 25 times the quantity of paper?—The time would not be so great as 25 times.

5794. Would it be possible for the Ordnance Survey to supply a triangulation to rapidly growing suburban districts, so as to enable the local authorities to keep up their surveys correctly?—Yes. If the Survey does that it might go a little further and supply skeleton plans such as that made of London; it would be very little additional expense.

5795. (*Lieut.-Gen. Cooke.*) What do you call skeleton plans?—Those upon which the roads and the ends of the houses are laid down.

5796. We are supposing that houses are not built?—I mean scattered houses.

5797. You mean the detail actually on the ground?—(*The witness handed in a London plan, which merely gave the lines of the roads and the streets in the outskirts.*)

5798. We are supposing that a town is wanting to lay out an extension, and that the houses are not built, but that they are going to build them?—What I mean is that the lines of the roads would be useful to the town—the lines of the existing roads laid down accurately.

5799. The idea is to triangulate the area on which the town is going to be built?—In addition I propose to give the outlines of the roads.

5800. It would help those who have to fill it up materially to have the streets and fences laid down as points to measure from?—Yes.

5801. (*Chairman.*) We have contemplated that?—One question which arises with regard to town plans is that of publication. The great difficulty is not the revision of the manuscript plans but the publication of revised editions of the plans. There will be hardly any sale for the revised plans, and the cost of publishing them at short intervals and cancelling obsolete impressions will be enormous, and scarcely a fair charge upon the Survey Vote. Perhaps the best way out of the difficulty would be an arrangement under which the Ordnance Survey should, as at present, revise the plans, but should only publish revised editions at the request of and at the cost of the town concerned.

5802. (*Chairman.*) That is a recommendation well worth thinking of?—In connection with the extension of the town surveys, a new definition of the word "town" is very much needed. We are constantly in dispute with the borough surveyors and the municipal authorities as to what is town and what is not town.

5803. (*Lieut.-Gen. Cooke.*) If they had to pay the cost that would very much disappear?—That would disappear. Another point connected with town maps is the colouring. The high price of the coloured maps is to a large extent due to the system of agency. For instance, on a coloured map which is sold for 20*s.* the agent gets 6*s.* 8*d.* For the same sheet uncoloured, sold at 2*s.* 6*d.*, he only gets 10*d.* The labour to the agent of selling a coloured map and an uncoloured map is identically the same.

5804. That cannot be altered so long as Stanford's contract holds good?—No, not so long as Stanford's contract holds good.

5805. (*Chairman.*) Are not some of the 25-inch coloured plans very expensive?—There are very few sheets of England which cost 20*s.* It is only in the case of 25-inch sheets which are completely filled with town buildings.

(*Chairman.*) What do the town plans come to?—(*Secretary.*) The maximum is 1*l.* 8*d.* (*Sir C. Wilson.*) In the case of a 1*l.* 6*d.* sheet 3*s.* 10*d.* goes to the agent.

5806. (*Mr. Roby.*) There is an objection to the coloured plan which several people raise; it prevents their putting a colour of their own on for their own particular purposes?—You can buy these plans coloured or uncoloured. I think this question has partly arisen from the present system of sale, for it is manifestly to the advantage of the agent to push the sale of the coloured maps in preference to that of the uncoloured ones.

5807. That is why Mr. Stanford never keeps uncoloured ones?—That is, I presume, the reason why he does not keep uncoloured impressions, and why, if anyone in the country writes for a sheet of the Ordnance Survey, a coloured impression is generally supplied. Before the sole agency was established, when there were agents in most of the towns in the country, we never, as far as I am aware, had complaints of that kind.

5808. Do you see any objection to the scheme of cross-hatching?—I am not quite certain about the evidence. The witnesses seemed to say that they preferred plain plans. When asked whether they liked hatching they said they had no objection to it.

5809. They were not quite certain, but they did not seem to raise any objection?—They said they preferred plain plans, but had no objection to hatching.

5810. (*Mr. Roby.*) The question was put to them in this way, you can either continue on the present system in which you have these plans all coloured at a high price or entirely plain, or you can have all the maps done in one way, hatched, and the witnesses said in that case it will obviate our objections about the colouring and about price, and we do not mind the hatching; we can use that very much as we do the plain plan?—They said we do not mind the hatching, but we prefer the plain.

5811. They do not mind the hatching if it is always given to them in one form?—In one form.

5812. (*Lieut.-Gen. Cooke.*) I think there was a very strong feeling that if the hatching could have been rather lighter there would have been no objection to it. They all objected to the present hatching as being too coarse. They said if the hatching can be done lighter then we should have no objection to it. That was the evidence of the greater number. Now, can the hatching be done finer?—I am afraid it will be difficult to do that, but I will have experiments made. Would the objection hold good if the price of the coloured map was very much reduced?

5813. (*Chairman.*) How can you reduce the price of the coloured map?—You cannot reduce it under the present system of sale, but when Mr. Stanford's contract comes to an end I think you might.

5814. (*Mr. Roby.*) What is the actual cost of colouring per sheet?—It varies in accordance with the closeness of the sheet. We give a good deal of colouring free. The system is to charge the piece-work price of the colouring, and then to add the agency and a certain amount for examination and superintendence.

5815. (*Lieut.-Gen. Cooke.*) It is the actual cost price, in fact?—It is the actual cost price, plus the agency, and a certain amount for superintendence and examination.

5816. You have tried colouring by printing, have not you?—Yes, but the editions are too small to make it pay.

5817. The sale is too small?—The edition is too small.

5818. (*Chairman.*) If the edition were much larger it would pay?—It would pay if you sold large editions, but there is no large sale for these maps.

5819. Probably under a better system of sale there would be a larger sale for the maps?—Under a good system of sale I think there would be a very large sale for the maps on the smaller scales. I do not think there would ever be a large sale for the large-scale maps.

5820. Including the 25-inch?—There would be a fair sale of the 25-inch certainly, but the average number of impressions printed, of the large-scale maps, is only 45, and colour printing does not pay for such a small edition. The conditions under which we publish plans are entirely different from those of private firms which publish editions of several hundreds or thousands of small-scale maps.

5821. (*Lieut.-Gen. Cooke.*) I should like to know exactly what is included in the cost of publication which guides the selling price. Where do you begin?—I think we begin with the supply of the transfer, but I am not quite certain. In the engraved map it begins with the printing from the copper plate.

5822. Take first the present 25-inch?—I think the cost of that begins with the supply of the transfer.

5823. The transfer from what?—From the negative. The 25-inch map is now a photo-zincographed map.

5824. It is laid down and transferred from the negative?—Yes; but I would sooner give that in the form of a return. (See Appendix IX.)

5825. I think it is very desirable that we should have it for all the maps?—Yes.

5826. (*Chairman.*) Here is a 25-inch sheet (Birmingham) coloured and priced at 20s. 6d. Could you give us an estimate of what this sheet could be produced at cross-ruled?—I will supply you with an estimate. (See Appendix XVI.)

5827. Do you think by any method of coloured printing you can produce those sheets at a reasonable cost, or at least at a largely reduced cost?—The sale of the large-scale maps is so very small that colour-printing does not pay. The average number of impressions on the 1/500 scale is 45, and that does not pay the cost of printing in colour.

5828. That is the town map?—That is the town map.

5829. And as to the 25-inch map, what do you say?—Of the 25-inch map the editions are too small to make colour-printing pay.

5830. Is it possible at all to state what is your average sale of sheets?—I think from 35 to 50 is the number for an edition of the 25-inch map.

5831. So that if there is any colouring at all it must be done by hand?—It is more economical to colour by hand, and it must be remembered that in the hand-coloured map the whole cost of colouring is borne by the purchaser. If the maps were printed in colour, unless their prices were raised, the cost would have to be borne by the Survey Vote, that is, by the public.

5832. When you had agents in every town I suppose they were paid in the same way as Mr. Stanford—by commission?—They received a commission, but a smaller one than Mr. Stanford now receives.

5833. But they got more when they sold a coloured map than when they sold a plain map?—Yes; the system was exactly the same.

5834. Should you think if the agent's commission was reckoned on the price of the uncoloured map, so that the result would be the same to him whether he sold an uncoloured map or a coloured one, a good deal of the objection to the existing cost would be removed?—I think a great deal of the objection would be removed.

5835. Because you could remove one-third of the cost of the colouring?—In that case we should only charge the cost of the colouring, and a slight percentage for superintendence and examination. In the case of this sheet (Birmingham), which is sold at 20s. 6d. 17s. 6d. represents the cost to the purchaser of the colouring, and of that amount one-third goes to the agent. For selling the sheet uncoloured the agent receives 1s., and for selling the same sheet coloured he receives 6s. 10d., although the trouble is precisely the same in both cases.

5836. (*Chairman.*) Have you any other matters you wish to bring before us, Sir Charles?—There is one serious question connected with the revision of the plans which requires careful consideration, and that is the question of boundaries. What is the Survey to do with the constant alterations to boundaries. To bring out new editions of the 25-inch plans, especially of the towns with the altered boundaries, means an enormous expense. My suggestion would be not to alter boundaries on the published plans until the general revision of the country takes place. If, however, any municipal or county authority asked the Survey for plans showing the altered boundaries, then the Department should show the new boundaries by colour on such plans as were required.

5837. (*Mr. Roby.*) Merely putting the new boundaries would not be so very expensive, would it, if you did not re-number the plots?—You would have to bring out a new edition of the plan and cancel all the impressions in store.

5838. You do not generally have in stock more than a dozen maps of a 25-inch plan?—We print an edition of from 35 to 60. If the question only referred to a small number of plans, we should have no difficulty, but every authority in the country seems to be altering areas at the present time. The alteration of boundaries has been very extensive.

Col.
Sir C. Wilson,
K.C.B.

21 July 1892.

Col. 5839. What is that due to?—It is partly due to the
 Sir C. Wilson, Divided Parishes Act, and partly to the power given
 K.C.B. to the county councils to alter boundaries.

21 July 1890. 5840. Are they making large use of their powers?—
 Yes.

5841. (Mr. Primrose.) Do you refer especially to parish boundaries in towns?—Ward boundaries.

5842. You say ward boundaries?—On the 10-foot scale.

5843. (Mr. Roby.) Not on the 25-inch?—There would not always be room for them on that scale. It has been proposed that the altered boundaries should be placed on the zinc plates, and new editions brought out at once showing the alterations. This would involve an expenditure of labour and money that would hardly be commensurate with the result. Would it not be sufficient to make these alterations when the periodical revision takes place, once every 15 years? During the interval new boundaries might be shown on impressions by colour when they are especially asked for by municipal or county authorities.

5844. Does every 25-inch plan bear a date?—For several years past they have been dated. I may mention that I had some correspondence with a gentleman in Northumberland with regard to boundaries, when I thought we were going to revise that county. I asked whether it would not be possible, in carrying out the revision of a county, for the Ordnance Survey to enter into some arrangement with the county council in regard to the revision of administrative boundaries. My view was that the county council might nominate a boundary committee, and that the Ordnance Survey Department might submit plans to that committee, showing the boundaries as ascertained by the survey, and that the committee might then decide what changes if any should be made. By this means an authority would be given to the Ordnance Survey boundaries in England, which they do not now possess. I believe the county councils are now the authority as regards boundaries, and if our plans were submitted to them and they approved of them it would give authority to our boundaries.

(Chairman.) I think you are attributing to the county council rather larger powers than it possesses. They can make a new boundary by an order, but they have no power to state that a particular boundary is the correct boundary, I think.

(Mr. Roby.) Except when they make it themselves.

5845. (Chairman.) Except when they make an order?—I thought they could recommend that a particular boundary should be the boundary of the parish.

5846. (Mr. Primrose.) Was not your meaning rather this: that it would give an opportunity of making any change which was going to be made at the time when it would be most convenient for the Survey Department. Do you suggest that the change should be made when it is most convenient for the Survey Department if it is to be made at all?—Such an arrangement was carried out with the Scotch Boundary Commission. We supplied them with maps showing every boundary in Scotland, and they approved of or altered our boundaries so that now all the boundaries in Scotland are authoritative boundaries.

5847. (Chairman.) I do not think as the law stands, that application to the county council would help you at all except as an advising body. I think your present scheme has worked as well as anything can be made to work. It is not absolutely perfect but it is quite certain?—What I was rather aiming at was that the English boundaries should gradually acquire the same authority as the Irish boundaries, which are never disputed. I think it would be a very great advantage to everyone if the English boundaries were in that settled condition.

5848. Are the parish boundaries very uncertain as regards the Survey?—We have a great number of disputed boundaries which we decide for Ordnance Survey purposes, and we lay those boundaries down on the maps from the best authority that we can obtain.

5849. I think that lapse of time will make any line shown on the Ordnance map an effective boundary. Disputes as to boundaries really arise in this way: a claim to rate is made by one set of overseers in respect of a certain property; another set claim to rate it. The occupier says he will not be rated by both parties, and there is a dispute. You settle on the best information you can get that the line includes a certain

piece in one parish and excludes it in another. I think your line is very likely to settle the question. There is no authority. The only authority is a court of law?—That is so.

5850. (Lieut.-Gen. Cooke.) I do not think the number of disputes is very great. I was for two or three years in charge of the Boundary Department, and I should say that the number of disputes, having regard to the whole area perambulated, is not great. You may have a parish without any dispute at all. Then you may have a parish with two little disputes, but my experience is that, considering the great number of parishes, the number of disputes is not very great?—No, not compared with the whole.

5851. On that question hangs very much the question of numbering. Would you be in favour of giving up the numbering altogether of the Survey plans and trusting to areas as a sufficient reference?—I rather look at the question from the Survey point of view—that of production. The question of numbering the parcels is a difficult one. In Ireland we omit the parcel numbers on the 25-inch plans, and we do so on the advice of Mr. Macdonell, the Registrar of the Land Judges' Court, who is organising the new land registry for Ireland. When I was in Ireland about 10 days ago Colonel Kirkwood informed me that Mr. Macdonell was coming to the conclusion that he would rather have the numbers on the plans. The question has not been settled, but Colonel Kirkwood expects to have in the course of the year a request from Mr. Macdonell to put the numbers on.

5852. (Chairman.) They having been originally put on and taken off?—No, they were never put on, because the 25-inch survey of Ireland is a new survey which was only commenced three or four years ago.

5853. (Lieut.-Gen. Cooke.) The numbers hamper you very much, do not they, whenever there is any alteration of boundaries or in the size of fields?—From the Ordnance Survey point of view it would be better to omit the numbers, but that is not the point of view to look at it from.

5854. It would be a very great relief to you if the numbers were done away with?—It would be a great relief to us, but our business is to supply what is most useful to those who use the maps. It is entirely a question of what is most required.

5855. (Chairman.) Have any representations ever been made to you about the numbers in England—the use of them on the plans?—I do not remember any representation. If there has been any correspondence it must have been with the Land Department.

5856. Since you were here the other day our attention has been drawn to the fact that the numbers are not permanent, and that at every revision or every change of boundaries the numbers are largely changed?—The numbers are largely changed.

5857. If the numbers had been what I have ventured to call "monumental," that is to say, permanent, they might have stood and might have been very useful, but considering that they are always changing it has occurred to the Committee that they are not useful?—That goes back to the question of the parish boundary which was formerly a stable boundary and is now an unstable one. With the alteration of the parish boundary, we had to re-number the parcels for the new parish. If the parcels were numbered by sheets there would be no difficulty.

5858. (Chairman.) Are there any other points, Sir Charles?—I should like with reference to numbering to show you what is done in Ireland by the Valuation Department. The Irish valuation is based on the 6-inch survey, and this is the way in which we prepare the maps for the Department. They supply us with information as to the townland boundaries, and send us the information which is printed in red. These parcel numbers correspond to the numbers in their books. In carrying out the valuation they take our areas of the townlands as the legal areas, and then compute the separate parcels, and the total of these parcels must agree with our townland areas. Then for assessment they estimate the areas of the smaller parcels which compose the larger divisions.

5859. (Lieut.-Gen. Cooke.) Those are their numbers?—Those are their numbers.

5860. Then you do not put numbers on which they adopt; they put numbers on which you adopt?—They put numbers on the 6-inch.

5861. (Chairman.) Those numbers correspond to the rateable properties. This man, for instance, has a whole strip, and these little patches (indicating on the map), and he is assessed in respect of them and a number is put on to represent his assessment?—In many places one number represents two or three assessments.

5862. (Lieut.-Gen. Cooke.) Why do not they use the 25-inch?—It is not ready yet.

5863. (Chairman.) That is very much agreeing with my opinion that the 25-inch map should not have numbers, and that the assessing body should put their own numbers on it.

5864. (Mr. Primrose.) I think as a matter of principle it is contrary to the principles of the Ordnance Survey to give descriptions of their own. These numbers do not correspond with anything except what is in the survey of 1846.

5865. Therefore you are giving a description of a parcel of your own. Is it the business of a survey to do that, and is it not rather the business of the people who want to describe the parcels to describe them themselves, either by colour or by number?—It originated in this way. At first area books were published, and each area book contained a description of the area books were necessary. When it was decided to print the map on the plans the question was referred to the Land Department who were principally interested in matters connected with land, and they were asked, "Do you wish us to abandon the parcel numbers or to keep them on," and they said, "We want you to keep them on."

5866. (Lieut.-Gen. Cooke.) I did not remember that it was referred to them?—My recollection is that it was referred to them.

5867. (Chairman.) The method of dealing with land in the index is so official that they have been asked to come to you to get the plan. Do you get a separate repayment for doing this work?—They pay us for it. I have brought some of the latest estates plans for inspection. Mr. Cook raised a question as to the 25-inch survey of Ireland. That survey was authorised after the Irish numbers had raised the question in the House of Commons, and these plans show why it was raised. This is a property sold through the Land Agents Office. This is the 6-inch map. These are the holdings of the tenants as far as they can be shown on the 6-inch scale, but it is found in every case that there are a number of holdings which can only be shown on the 25-inch scale, and have therefore to be surveyed on that scale. It was a grievance that these surveys had to be made at the cost of the landowners, and they were a great expense to them when they sold their estates. When the new Land Act came into force, and these small parcels were sold to the tenants, a 25-inch survey became an absolute necessity.

5868. Are these all separate tenements?—They are all separate tenements, and they can only be shown separately on the 25-inch scale.

5869. (Lieut.-Gen. Cooke.) Are not they all separated by fences?—Some of them are fenced and some are not. This is another estate. These (indicating) are the holdings as far as they can be shown on the 6-inch scale, and that (indicating) is an enlargement on the 25-inch scale. All these surveys have been made at the cost of the landowners.

5870. Mr. Biddish. Do you make these surveys for the land judges with the same accuracy as for the 25-inch map of England?—Yes, the boundaries of the estates are defined, and in sales to tenants we generally define the boundaries of the holdings.

5871. Whether the boundary is a fence or a ditch?—Yes. In these cases sometimes as many as 4 or 5 copies are required and we have to print them. This is a fourth map of the Phoenix Park, which has been specially prepared for the War Office.

5872. (Chairman.) With reference to the indexes. I think the effect of the evidence which we have had is now to be better to have a separate index to each map?—That we do now. The question is whether the indexes meet the requirements of the public. This is a specimen of a recent town index, Manchester.

5873. (Lieut.-Gen. Cooke.) The town index there is a specimen of a recent town index, Manchester. The 25-inch, the 6-inch, and the 1-inch that we require discussion?—This is

the 25-inch index. That has nothing on it but the 25-inch sheets.

5874. (Chairman.) The objection to the index was that it did not cover a sufficient area—a person could not find his way about it.

5875. (Lieut.-Gen. Cooke.) This was a specimen of index for the 25-inch, but there was an objection to having the 6-inch and the 25-inch numbers mixed up together?—That is one of the old proposals, this is the new form. Since Mr. Wyld's evidence was taken we have tried experiments in printing the sheet lines in black, and we find that the black goes rather better with the colours. The red was adopted at Mr. Stanford's suggestion, it is a much better colour.

5876. Then what is wanted is the 25-inch exactly like this, only with 25-inch sheets. (Mr. Primrose.) One witness, I think, was in favour of printing the two in different colours. (Lieut.-Gen. Cooke.) That is the 6-inch and the 25-inch together; but the public have great difficulty in distinguishing between the two scales. Stanford thinks that the 6-inch, and the 25-inch, and the 1-inch, ought to be distinct. Both the public and the surveyors would like to say that the indices ought to be distinct?—That is what we do now.

5877. Some of the witnesses want all three together, the 6-inch, the 25-inch and the 1-inch. I suppose that would be a very good thing, would it not? We have had a specimen of that. The sheets were printed on a 4 mile index map. Here Mr. Wyld's evidence, Q. 1979 to 2000, was taken. Mr. Wyld argued that the 25-inch index, the Land Department always insisted that the 25-inch index should be by parishes. The view was that the public would not be able to find their way about it, and that if he wanted to buy a map of the land, all he would have to do would be to write up for his parish index and it would be sent down to him; he could then tell at once the sheets he wanted.

5878. (Mr. Brickdale.) I think the term "county" and "parish" does not appeal to the general mind?—There was some correspondence with regard to the 25-inch index with Mr. Stanford. At his request we printed a specimen of the index, and we found that the public would not be able to find their way about it, and that if he wanted to buy a map of the land, all he would have to do would be to write up for his parish index and it would be sent down to him; he could then tell at once the sheets he wanted.

5879. (Chairman.) These large squares are the 6-inch map?—No, those are the 25-inch. My objection was that the 6-inch map was not a good index, and that the particular sheet in which his field or house lay, it was not a good index, and that the particular sheet in which his field or house lay, it was not a good index, and that the particular sheet in which his field or house lay, it was not a good index.

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5882. Do you think that the 25-inch 4-mile index showing civil parishes ought to be kept up as an index. Many of the civil engineers prefer to have all the scales together, and then if they want the 1-inch scale they know directly how to get what they want. Should you say that ought to be continued in addition to the others?—Yes.

5883. (Chairman.) Do you think that it is possible to have the lines in different colours, would that be a thoroughly satisfactory index?—Yes, but you would still require others.

5884. (Lieut.-Gen. Cooke.) It is only meant for educated people, civil engineers and people who are accustomed to handling indexes; they get to know the different points?—The question of sale comes in, and affects the index. The proposition I have to make is, that a 25-inch index should be put up in the post.

Col.
Sir C. Wilson,
K.C.B.

21 July 1892.

*Sir C. Wilson,
K.C.B.*

27 July 1892.

office of every district with a specimen 25-inch plan, so that any sheet could see at once, in the post office, the sheet he wanted.

5885. There is a question which has been very much raised that we ought to have skeleton indexes which would be presented gratuitously and would not act as maps of the country. It was insisted on by Mr. Stanford and Mr. Wyld that there should be cheaper indexes that you could send all over the country and which would not be used as a map—mere skeleton indexes?—I do not think you could prepare skeleton indexes much cheaper than those which we prepare now. I have heard the objection before, that if we issued indexes of this kind people would not buy the maps, but as far as my experience goes that is not the case. It might possibly stop the sale of very small-scale maps.

5886. You sell that for 3d., do not you?—Twopence.

5887. Six of those would go to a 1-inch sheet, nobody would buy them?—Nobody would buy them to make a map of because they are partly disfigured by the sheet-lines of the maps on the larger scales.

5888. Are the parish maps affected?—This is a parish index. I do not think the circulation of those indexes stops the sale of one sheet of the parish map of England.

5889. This index of Yorkshire is really a nice little map of the district?—It has the sheet-lines on it. I do not think it stops the sale of a single sheet. My proposal with regard to the post office was that one of these 25-inch indexes should be put up in the post office in a prominent position with the price stamped on each sheet. I would also have a specimen of the 25-inch map of the locality immediately round the post office put up. That would advertise the maps, and, as regards sale, I made a calculation and found that at the present selling prices we could send a map by return of post, paying the postage and the cost of the cardboard tube, and still let the purchaser have it at exactly the same price that he now pays the agent. My suggestion was that the purchaser should buy a postal order covering the cost of the map, and that the postmaster should simply stamp the word "maps" on the postal order. That would kill the postal order, and the purchaser would then put it into an envelope with a little form stating the number of the sheet that he required.

5890. (Chairman.) Supposing he made a mistake in his sheet?—I do not think he could very well, but if he did and we found it was not due to carelessness we should exchange the sheet; we have done that very often.

5891. Does not your agreement with Mr. Stanford preclude that. May you sell the map?—No, we cannot sell a map.

5892. You cannot?—We cannot sell a single sheet.

5893. Then you could not carry out that arrangement?—It cannot be carried out until the contract comes to an end, but it is an arrangement which I think would work easily, without much trouble to the post office, and with certainly no more trouble to us than there is now. At present Mr. Stanford demands on an average about 28 or 29 single copies of sheets every day, so that under the proposed arrangement there would not be much more trouble than there is now.

5894. You supply Stanford with single sheets to a considerable extent?—Only of uncoloured maps. On an average we get 28 demands in a day.

5895. (Lieut.-Gen. Cooke.) Of course, they all go in one parcel; they are not separately packed?—No; they go in one parcel. I proposed simply to put them into tubes. It is not very much trouble. As an instance, the selling price of the 25-inch sheet is 3s.; of that the agent gets 1s. and the Government 2s.; under the proposed arrangement the Government would receive 2s. 4d., the tube and postage would cost 6d., and the cost of sending the postal order (the postage I propose should be paid by the Government) would be 2d., so that the purchaser would only have to pay 3s. without

any charge for postal order or postage, and would get his map the next day.

5896. (Chairman.) In fact the Government would get 2s. 6d. divided between the post office and you?—The Government would get 2s. 4d.

5897. 2s. 6d., Sir Charles. 2s. 4d. the Survey Department would get, and the post office 2d.?—I suppose the 2d. would be expended in carriage.

5898. The Government would get it?—The Government would get it.

5899-5900. (Lieut.-Gen. Cooke.) There is one point that has been a good deal insisted on, and that is the putting of the explanation of the characteristic signs on the sheets. That is done very much on foreign maps. I suppose that will be practicable?—Under the old system, when area books were published, each area book contained the conventional signs, but when the area books were discontinued the signs were not put upon the map. I think we give too many marginal names, and if we could get rid of some of them we could put the conventional signs on. It is only a question of room.

5901. The scale takes up an enormous deal of room?—That is put on by order of Parliament.

5902. What is the order?—There is an order that there should be two distinct scales.

5903. If the scales were put one under the other, it would give ample room for the characteristics?—Yes. With regard to the characteristics, how far is it proposed to go?

5904. I would put all the characteristics?—That would require rather a large table.

5905. I would certainly put the characteristics of roads. Are you going to do away with dotted lines for unfenced roads according to the recommendation of the military committee?—Yes; it was considered to be a distinction which it was not necessary to keep up.

5906. Could not you keep the three characteristics for military purposes?—I think the road question is one that should be settled in conjunction with this Committee. The feeling of the officers who gave evidence was that all they required was that a distinction should be made between the main roads and between metalled roads and unmetalled roads.

5907. (Chairman.) Is not the scheme a very good one, to show a big road with 14 feet of metal on which two carriages can pass as first class, and then a road inferior to that but metalled as second class, and a road over which no fast or carriage traffic goes as third class, whether it is a mud road or a cart road over which you could not well drive a carriage and pair?—Yes.

5908. (Lieut.-Gen. Cooke.) At present the roads cannot be distinguished unless they are together, but if you have a dotted line you have a distinction at once?—Yes.

5909. You do not see any objection to adopting that generally?—I think it would be desirable; there have been so many complaints about roads.

5910. You now use one single dotted line for foot-paths?—One dotted line.

5911. (Chairman.) With regard to indices, if the lines of the 6-inch index were printed in blue, and those of the 25-inch index in red, that 2-inch scale county index would be a perfect index?—Yes.

5912. (Lieut.-Gen. Cooke.) I think so too. (Mr. Brickdale.) On that scale?—On that scale. It is necessary to have a good index, because you cannot return a map as you return a book, and if many maps were returned in consequence of wrong orders, a large number would be spoiled.

5913. (Lieut.-Gen. Cooke.) I think we have come to the conclusion that for the general public we must have separate indices; to have all the indices on one sheet will only do for educated men?—I quite agree. There is one great inconvenience in the present arrangement, and that is that the Ordnance Survey Department has absolutely no control over any circulars that the agent issues, or over anything that he does in respect to the maps published by the Department.

The Committee adjourned.

Board of Agriculture, 3, St. James's Square, S.W.

SEVENTEENTH DAY.

Tuesday, 9th August 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.,
 Mr. HENRY WILLIAM PRIMROSE, C.S.I.
 Mr. WILLIAM MATHER, M.P.

Mr. HENRY JOHN ROBY, M.P.
 Mr. CHARLES FORTESCUE BRICKDALE.
 Major DUNCAN A. JOHNSTON, R.E., *Secretary.*

Mr. CHARLES FORTESCUE BRICKDALE examined.

5914. (*Chairman.*) You are a practising barrister and conveyancer, and author of works on various Acts of Parliament relating to land registration?—Yes.

5915. You also hold an appointment in the Land Registry, and have made a special study of the conveyancing and registration systems in the colonies, America, Germany, France, and other countries?—Yes.

5916. Speaking generally, are maps much used for conveyancing purposes in England?—Speaking generally, whenever an estate is cut up for building purposes, or wherever holdings are to be redistributed on any large scale, or where there are adjustments of boundaries, maps are used on deeds, but usually where no such alterations are to take place there is no map; some solicitors, however, adopt the practice of having maps wherever they can. They consider that it appeals to the eye and describes, in a way that most people understand better than any other, where the land is, and what it is that is being conveyed. The maps are supplemented of course by verbal descriptions and, in many cases, by schedules also.

5917. Is the Ordnance map much used?—I should say that compared with the tithe map it is not much used.

5918. Not of recent years?—It is coming in gradually. The use of the Ordnance map generally involves a certain amount of alteration from old maps which were in former deeds, and that means trouble, and getting a surveyor in to look over the matter instead of entrusting it to a solicitor's clerk only, and consequently many people prefer copying the old maps where they use them to adopting the new ones.

5919. With all their errors?—With their errors, which are not usually very serious, but when they are compared with such a very exact map as the Ordnance map is, they are made very apparent.

5920. (*Lieut.-Gen. Cooke.*) Where there was no old map in connexion with the transaction, would they then go to the tithe map or to the Ordnance Survey? I quite understand that when the tithe map has been used they would stick to it, but when it has not been used, would they then go to the tithe map in preference to the Ordnance Survey?—I should think that if it was fairly before the mind of the solicitor or counsel preparing the deed that there was a choice he would certainly use the more modern Ordnance map, but the tithe map still holds the field rather with reference to conveyancing.

5921. (*Chairman.*) On the tithe map there are numbers?—Yes.

5922. And those numbers cannot possibly be altered?—No, except by the additions of *a* and *b* where there are divisions.

5923. I mean to say, any number is practically permanent with reference to the plot of ground on which it was originally fixed, however that plot of ground may have been cut up afterwards?—Yes, speaking generally.

5924. And that, I suppose, is a distinct advantage?—Yes, it is, particularly in tracing title.

5925. In cases which have come under your observation where the Ordnance map has been used, have the numbers on the Ordnance map been used in the same sort of way that the numbers on the tithe map have been used?—Yes, they have been used in descriptive schedules accompanying the map.

5926. Under the belief that they were permanent numbers?—Probably.

5927. It would be a serious disadvantage then, probably, if those numbers were changed, from the conveyancing point of view?—It would involve trouble in the future.

5928. And difficulty of identification?—Not so much difficulty where a map accompanies; but if reliance is placed upon the numbers, and there is a schedule to the deed and no map accompanying, it certainly might lead to a good deal of confusion.

5929. (*Mr. Roby.*) I suppose in case of doubt the verbal description would be held to be the better evidence than the map, would it not?—Usually the verbal description is so made that it governs the map entirely, and it is the practice of the older conveyancers to make the verbal description supreme.

5930. But then the verbal description is based upon the adjoining properties, is it not?—In the case of small properties that was the old way generally, but there is every variety of verbal description.

5931. (*Mr. Mather.*) Do you use the maps at all to found your verbal description upon, or do you simply use them for illustration?—I should say that the usual full way of describing property in a deed is to give, first, the general name, acreage, and nature of the estate, including sometimes the names of the surrounding properties and owners, and then to refer to a particular description in a schedule and further delineation in a map.

5932. And for that purpose you use the Ordnance map?—For that purpose the Ordnance map is now coming in—but slowly.

5933. (*Mr. Roby.*) Do you think that solicitors are very much aware of the existence of the 6-inch or the 25-inch Ordnance maps?—They are to a certain extent, but I think what they do is usually to follow the old groove.

5934. (*Mr. Primrose.*) They do not have special surveys made often?—Not often; I should say hardly ever, except where property is being altered and cut about.

5935. (*Mr. Mather.*) In the case of the projection of a new railway the solicitors that would have the matter in hand must necessarily refer to maps of the properties which they have to purchase. Would they not go to the 25-inch or the 6-inch Ordnance maps for the information?—I have not any personal experience of how they set to work for a railway company, but I suppose they take the parliamentary plans as their basis.

5936. Yes; but in scheduling property to begin with, would they not have to resort to some map, either making a special survey of property or resorting to some

Mr. C. F. Brickdale.

9 Aug. 1892.

Mr. C. F.
Brickdale.

9 Aug. 1892.

well-known map, and that would be the Ordnance Survey, would it not?—I should think they would begin with the Ordnance map and find out who are the owners of the various lands shown on the Ordnance map that they want to buy, and then they would investigate those owners' titles and see that the evidence of title applied to the whole of the land which they had got in their Ordnance map. In that way they would use the Ordnance map, but they would not find references to the Ordnance map very often on the title deeds.

5937. (*Chairman.*) And in conveyancing, is it not the practice in the verbal description generally to repeat the names of the persons who are mentioned in previous deeds as occupying the adjacent land?—Yes, it is very common, and sometimes, particularly in connexion with copyholds, these descriptions of land are absolutely useless, the names given being those of people who have been dead for centuries.

5938. Of whom no record remains?—Of whom no record remains at all; but in other cases the descriptions are revised every time the property is dealt with. The very greatest difference exists in the way in which deeds are prepared in that respect.

5939. So that if you could by satisfactory reference to an authorised map give descriptions of boundaries it would be more convenient for conveyancing purposes than the existing methods?—If you could rely upon their being accurate.

5940. Have you any knowledge of what happens in France?—In France, from what I have been able to learn, it is almost invariable to make conveyances by reference to the numbers on the local cadastral maps. Parcels are very small and very numerous, and people are poor and cannot afford to have special maps made for their conveyances, and they rely almost entirely for descriptions upon the official map, because it is in the Town Hall.

5941. I suppose your attention has not been drawn to the report which is being made in consequence of an investigation into the French cadastral maps which is now going on?—No.

5942. In the first place, one witness before the French Commission says "that the maps are perfectly useless for want of revision;" and Mons. Debray gives a most singular view of the uselessness of the cadastral maps in France. He says that "the cadastral plan is not free from grave errors, and that a friend of his had bought two contiguous parcels with a house that stood partially on both of them, and notwithstanding their proximity, these two parcels are represented on the cadastral list as being 300 yards apart." That is an exemplification of the way in which the cadastre may be misleading. If the Ordnance map is to be used for conveyancing purposes, it wants to be pretty constantly revised?—That is the most important thing for conveyancing purposes.

5943. Do you think that if it were constantly revised it would make it more popular for ordinary conveyancing purposes?—I doubt whether that alone would make it more popular. In the country the tithe maps still hold the field, and it takes a long time to make a change, and with towns, special surveys are usually made for the laying out of property, and that would always be more or less ahead of any official map that there could be; but at the same time an unrevised Ordnance map is certainly quite useless for conveyancing in suburban districts. What I should wish to say would be that although revision would not of itself bring in the Ordnance map, yet unless it is frequently revised in some way the use of the Ordnance map is impossible in suburban districts.

5944. You are inclined to think that the large town map can never be made of much service for conveyancing purposes?—Not under the present system of rare revisions as regards suburban property. Central parts of towns it can be used for even if only rarely revised, but in suburbs and growing districts it must be revised practically every year or oftener to be of much use.

5945. You would be almost inclined to say then that unless the Ordnance maps in growing districts were revised annually they would always be useless for conveyancing purposes?—They can never be thoroughly popular for conveyancing purposes.

5946. Would any alteration in the mode or style of publication make it more useful for conveyancers?—I think perhaps if the edition on strong thin paper which has been suggested by some witnesses were made it

would be useful for binding up with deeds. Deeds have to be folded and they must be of a particular size. There are certain recognised sizes which pack away in cupboards, and a map that will not fold has to be copied, and that is an expensive process more or less. But if there were maps on thin paper I think they could be bound up with deeds and made useful directly.

5947. Are the sizes of the sheets useful or are they too large or too small?—They are too large as long as the paper is thick.

5948. If printed on thin paper that could be folded there would be no difficulty?—There would be no difficulty in using it just as it is.

5949. (*Lieut.-Gen. Cooke.*) What scales would that apply to?—For very large estates in the country the 6-inch map would do very well, for ordinary small estates the 25-inch map.

5950. Then you are not referring to the town scales? Do you include the town scale in what you want the thin edition for?—I think it was hardly proposed to make a thin edition of the town scales. I have no doubt it would be useful if made.

5951. You were saying you wanted thin editions of some of the maps, and I wanted to know of what scales you wanted the thin editions?—A thin edition of the town scales would certainly be useful, but I should hardly think it could be made.

5952. Your suggestion, then, applies particularly to the 6 inch and 25 inch?—Yes.

5953. (*Chairman.*) If there were an edition produced on thin paper it would be made use of by the legal profession for deeds?—I think it might be.

5954. It has been objected to the Ordnance map as a conveyancing map that it only marks physical boundaries (as walls, hedges, banks, and the like), and that these very seldom coincide with the true boundaries of the property. Do you consider that objection well founded?—No, I do not think it is well founded. In the first place the tithe maps that we have been using for so many years are exactly the same, they mark the physical features of property. Also the exact position of property boundaries can always be shown on a map which shows the physical features correctly. You can use conventional signs, and you can put dotted lines by way of distinction from the physical boundary, and (as has already been pointed out by other witnesses) to investigate the question of where the property boundary goes is not within the competence of any map maker. The customs in different parts of the country are exceedingly different as to the position of the boundary. Usually it is 3 or 4 feet from the actual fence: But in some places, particularly round old parks, there is what is called "a free board," which is 8 feet outside the boundary, and I have even known a place where they have what is known as a "deer leap," which is 16 feet outside the boundary. These things are obviously matters which no map maker can be expected to know, and the people who do know can very easily add them to maps which show the physical boundaries. Then as to the question of areas, of course the Ordnance map area means the area enclosed within the physical boundaries shown on the map; but I do not think there would be much difficulty in allowing for the extra 2 feet, or 4 feet, or 6 feet, or whatever it may be, along each side.

5955. (*Mr. Roby.*) Especially with your conveyancing terms, "more or less"?—Yes.

5956. (*Chairman.*) Do you know whether the areas given in the tithe survey are the areas given in the physical boundaries or the property boundary?—I do not know for certain, but I believe they are according to the property boundaries.

5957. I have heard it said that the older conveyancers objected to the use of maps in deeds altogether, or at any rate insisted on their being kept very much in subjection to the verbal descriptions of the land to be conveyed. Do you agree with that view?—I think that if a map is not exact it is very dangerous to make it the principal description; but with the improvement in maps that is taking place now it is more and more possible to make the map the principal part of the description. The old descriptions of land are exceedingly vague. The earliest are the vaguest, and I should say the history of descriptions of land in deeds was a history of continually increasing exactness, and the introduction of maps and schedules instead of more

popular rôving descriptions. An exact map I think, in fact, is the best description of all that you can possibly have. The only difficulty is to make quite sure that it is exact enough to rely upon without any further description. The vagueness of the old descriptions was very great, and the old conveyancers were aware of it, and so they used to adopt what was called "general words," which would have the effect of removing any defect which the incompleteness of the description might bring into the conveyance. I will venture to read one of them. After the description of the land there would be added, "together with all and singular the houses, outhouses, edifices, buildings, barns, dovehouses, stables, yards, gardens, orchards, lights, easements, ways, paths, passages, waters, water-courses, trees, woods, underwoods, commons and commonable rights, hedges, ditches, fences, liberties, privileges, emoluments, commodities, advantages, hereditaments and appurtenances whatsoever to the said messuage or tenement, lands, hereditaments and premises hereby granted or intended so to be or any part thereof belonging or in anywise appertaining or with the same or any part thereof now or at any time hereafter usually held, used, occupied, or enjoyed or accepted reputed taken or known as part parcel or member thereof." You will easily see that a description ending in that manner has an elasticity with which no map can hope to compete. And although these words do not now occur in a conveyance it is only because a modern enactment of 1881 (Conveyancing Act, 1881, section 6, sub-section 1) implies in every conveyance not quite all these words, but the following; which are almost as comprehensive. "A conveyance of land shall be deemed to include, and shall by virtue of this Act operate to convey, with the land, all buildings, erections, fixtures, commons, hedges, ditches, fences, ways, waters, water-courses, liberties, privileges, easements, rights, and advantages whatsoever, appertaining or reputed to appertain to the land or any part thereof, or at the time of conveyance demised, occupied, or enjoyed with, or reputed or known as part or parcel of or appurtenant to the land or any part thereof." Of course as long as those general words are kept either expressly or impliedly in deeds the map and the rest of the description may be almost as loose as you like, and any defect can be remedied afterwards by reference to them.

5958. (*Mr. Mather.*) So that the map is a picture under those circumstances?—The map is not much more than a picture. Mr. Joshua Williams, the father of modern conveyancing, used to say, "A map was a good servant but a bad master," and I think by that he meant that in his experience of maps they were not made with sufficient accuracy to justify the conveyancer in putting all his reliance upon them.

5959. (*Chairman.*) You think then that the objection to the use of maps on the part of conveyancers is partly due to ancient prejudices founded upon imperfection in maps?—In great measure.

5960. And that if the maps were accurate they might come into use for conveyancing?—Yes, I think that the ideal conveyancing is by a map.

5961. Can you suggest any particular direction in which the use of the Ordnance map for conveyancing purposes might be advanced?—I think that there are one or two ways in connexion with public departments. First of all the Land Tax Commissioners. One of the great difficulties in connexion with the redemption of land and the incidence of land tax is to find out from the commissioner what particular land is included in any redemption or is subject to any particular assessment. If the Land Tax Commissioners were obliged universally, as some Land Tax Commissioners do in fact now, to keep accurate plans, showing on the Ordnance map the various areas out of which particular land tax issues, and also the areas which have been redeemed under any particular contracts, it would be a very great advantage in the deduction of title, and would also help to make people familiar with the Ordnance maps. And so, too, with succession duty; in many instances, I think, it would be a great help if the Inland Revenue authorities were to refer to an Ordnance map in giving their receipts for succession duty. There is nothing more direct than that.

5962. In what way should they refer to it; by the numbers?—Where the parcels are not divided in any way the number would be quite sufficient, but where,

as in many cases, the numbers do not quite correspond with the holding it would be necessary to add a tracing.

5963. And supposing the numbers change and vary?—The only way to prevent confusion from that cause would be to refer to the particular edition.

5964. Number so-and-so on the map of such and such a date?—Yes.

5965. (*Mr. Roby.*) But is it a list that you are thinking of; would not there be some document which they could actually supply you with showing marked on the actual map itself what was exempt from taxation—what had been redeemed?—Yes, that would be the best way, but it might be rather expensive as the amounts are not very large as a rule.

5966. (*Lieut.-Gen. Cooke.*) We have asked one or two witnesses the question—I daresay you remember—whether the areas on the plots could be taken for the same purpose as the numbers now are, and thereby dispense with the numbers; what is your opinion? You would refer to plot 2-325 acres instead of plot Number 567?—I think that with care it would not lead to any difficulty; but it might need rather greater care than copying of consecutive numbers.

5967. The numbers very often are not consecutive now, so that you cannot trust that, because No. 26 is here, No. 27 would be alongside of it?—No. Perhaps, really, it would not require greater care than at present.

5968. (*Mr. Mather.*) Would there be any inconvenience in it?—No, I think it would be neutral, quite.

5969. A matter of indifference then?—From the conveyancer's point of view.

5970. (*Chairman.*) It would be more permanent to refer to the area?—Yes.

5971. Turning now to the subject of land registration. I understand the Ordnance map is largely used in the Land Registry?—Yes, almost exclusively used.

5972. Which scale do you use?—First of all the entire map of England on the 6-inch scale is kept in the office for index purposes. Every estate that is registered is coloured on the 6-inch map so as to show that the land is registered and is marked with the number of the title. In towns, of course, it is necessary to have the larger scales for index purposes.

5973. Do you mean the 10-foot scale or the 25-inch?—I do not think that more than the 25-inch is usually necessary for index purposes: where an enlargement is needed it can be made in the margin generally. Then, besides indexing, every estate on its registration must deposit a map, and now we use nothing but the Ordnance map brought up to date either by the Ordnance Survey themselves or by a local surveyor approved by the Ordnance Survey to do the work. For country land the 25-inch scale is the usual scale, but if the estate is very large and does not run into villages too much, the 6-inch map is sometimes used instead, in order to save space and cost. For towns the largest scale published is always used, and sometimes in suburbs a map is made specially in continuation of the 10-foot or 5-foot scale, whichever it may be, by enlargement from the existing 25-inch map, so as to correspond with the larger scale when that is extended to it.

5974. Do you think that is sufficiently accurate?—It is generally checked on the ground to a certain extent.

5975. An enlarged map checked on the ground answers the purpose?—Yes.

5976. (*Mr. Roby.*) The enlarged map not being enlarged by the Ordnance Survey?—Not necessarily.

5977. (*Chairman.*) Are there then surveyors all over the country certified by the Ordnance Survey as competent?—Not as a regular institution, but we have never found any difficulty in getting a surveyor whose work was sufficiently good for the purpose.

5978. (*Mr. Mather.*) But is it checked by any officer of the Ordnance Survey?—We have our own map department, which consists of Ordnance Survey officers.

5979. And they check these maps?—They can tell generally by the look of a map when it comes in whether it has been made by a competent draughtsman or not; they have means of testing it which I do not understand.

5980. (*Mr. Roby.*) When you say "consists of Ordnance Survey officers," are they in the pay of the Ordnance Survey? Or are they persons who have been

Mr. C. F. Brickdale.

9 Aug. 1892.

Mr. C. F.
Brickdale.

9 Aug. 1892.

engaged previously in the Ordnance Survey?—They are in the pay of the Ordnance Survey and lent to us.

5981. (*Chairman.*) From time to time you apply to the Ordnance Survey office to send you persons to do this work?—Yes.

5982. For a day or two or constantly?—We have one permanent and two almost permanent, and then in cases of exceptional stress we apply and get extra help for a day or any longer period.

5983. How is that paid for; are those people borne on the estimates for the Ordnance Survey or do you pay them; or do you repay the Ordnance Survey Department?—They appear in our estimates in a lump sum, so much for "Civil Assistants, Ordnance Survey." How the Ordnance Survey account for it I do not know; we receive the bill once a month.

5984. You pay this to the Ordnance Survey?—Yes.

5985. (*Mr. Roby.*) What is the rank or position of these men; I mean what kind of payment do they get?—From 150*l.* to 250*l.* a year.

5986. They are not Royal Engineers?—(*The Secretary.*) No, they are what we call civil assistants or temporary assistants.

5987. Are they properly qualified surveyors?—Yes, they are properly qualified surveyors.

5988. People who can go on the surface of the ground and make the map?—I should imagine so. (*Mr. Brickdale.*) Our principal man is a thoroughly trained surveyor and has been in many parts of England surveying land.

5989. (*Chairman.*) Do you find these maps are satisfactory in their mode of publication?—Yes, we should find the thin paper useful, because we issue land certificates to which a tracing of the deposited map is attached, and it would be cheaper and more satisfactory to have a thin paper impression to issue with the land certificate.

5990. In using the 25 inch and using the 6 inch in country districts do you find the maps require much correction before you use them?—It depends so very much upon the estate. I have known estates registered without any correction at all, and in the country I have never known the corrections amount to anything at all serious. It means the straightening of a fence; or the inserting of a new road that has been put in since the map was made, but nothing leading to much expense or trouble. Also in the central districts of towns we find them quite satisfactory, the alterations are small and can easily be inserted without expense. But in the suburban districts of course it is quite another matter.

5991. You think that the revision even in the centre of towns is not largely required?—No.

5992. Would you ask for regular revision within definite periods, that no maps should be older than a certain date?—In the country there is no difficulty, or in the central parts of towns, but in suburbs the map is in some cases almost useless, because we are obliged to have the maps sent to us in such a form that we can locate the estate upon our index map, and therefore where a plot, however small or insignificant it may be, is in the middle of a district which has been laid out with new roads which do not appear upon the Ordnance map at all, a very considerable amount of surveying, amounting even in small cases sometimes to 2*l.* or 3*l.* in value, has to be done before we can get a map of that description. I have known small cases go off on that account solely.

5993. (*Mr. Roby.*) That expense is put upon the person applying?—Upon the applicant, yes, at present. Of course, if registration were made compulsory this difficulty would vanish, because the expense in such cases would be divided among a large number.

5994. (*Chairman.*) Can the map be made to show all necessary detail on the scales which you use?—Yes, with occasional enlargements, which there is never any difficulty in making.

5995. Is it in your opinion more necessary to use a general public map in the case of registration than in the case of private conveyancing?—Yes, certainly, because in the case of private conveyancing it does not very much matter if your map or your description includes more than the land which you possess, it does nobody any harm, but in land registration the maps of contiguous estates must be consistent with one another, otherwise you register two people as

owners of the same land. Also it is necessary to do it according to a general system, otherwise your index becomes impracticable. You must know what land has been registered and what has not, and the only way to do that is to have a uniform system of maps and to mark every estate as it is registered upon a general index.

5996. How do you deal with these difficulties of the actual estate not coinciding with the physical boundaries shown on the map?—At present it is met by a provision in the Land Transfer Act that boundaries shall not be conclusive, which means that there is a certain margin of elasticity all around the edges of the registered estates, so that when we mark our red line (which shows the boundary of the estate) running along a hedge it does not necessarily mean that the boundary is exactly at the hedge, or within it, or beyond it.

5997. In fact, you do not profess to go beyond a customary boundary, although the physical boundary may do so?—Yes.

5998. (*Mr. Roby.*) Am I right in saying that your answer would be rather this, that the boundary that you mark on the map is subject to the custom of the district?—Well, I should prefer to say that it is subject to the actual fact, whatever it may be; it is not always a matter of custom, it may be a matter of grant; a man may grant 3 feet inside of his hedge.

5999. (*Chairman.*) Can you suggest any mode of revision which will be sufficient for the purpose of land registration without, in your opinion, putting the Government to an inordinate expense or making an oppressive demand on local bodies?—I think that if every local body, both in the country and in the towns, were charged with the duty of keeping in some public place a copy for country purposes on the 25-inch scale, and for town purposes on the 5 or 10-foot scale of the Ordnance map, and through their own officers inserting upon it in colour the alterations of roads and important new fences from time to time, that that would be quite sufficiently accurate for the purpose of land registration, and would save a great deal of expense that now has to be incurred by the making of special surveys for the registration of small plots, particularly if the Ordnance Survey could assist the local bodies in this work to the extent of giving them triangulation in the way which has already been suggested by other witnesses. Then any member of the public would be entitled to a tracing or copy of the map in its existing state, and alterations, however recent, would be brought together on this public map, and available for all ordinary property purposes.

6000. I quite understand how a local body might do that, in a town governed by an urban authority, where there is invariably knowledge of all alterations of frontages and all boundaries; but how would that operate in the country? Roads, of course, are known of by the local authority, whatever it may be, but alterations of fences are outside any official knowledge, certainly, of any form of Government?—I think that in the country it would be sufficient if new roads were marked publicly for the purpose of land registration. Alterations of fences are very easily put in on special survey.

6001. And that would be met by periodic revision by the Ordnance Survey?—Yes, no doubt the Ordnance Survey would carry on its own system of periodic revision, which would collect altogether all these weekly or monthly revisions made by the local bodies, correct them where necessary, and possibly re-publish them.

6002. Is it in your mind then that there should be a legal obligation on all local authorities to be at all times provided with a 25-inch map at least of their district corrected up by themselves within 12 months of date?—Yes.

6003. And how would you enforce that?—In the same way that other duties on local authorities are enforced. I think that one year is rather a longer period than I should like to see allowed; I should have thought three months.

6004. That everything should be put on within three months?—That everything should be put on within three months.

6005. (*Mr. Mather.*) In the counties there would be very little alteration in roads?—I should think very little indeed.

6006. (*Chairman.*) You consider that the publication of the revised map is not so very important a factor in

its general usefulness for registration purposes?—No; in fact, I think that the publication is rather an impediment to its usefulness, because it impedes correction and gives the Ordnance Survey a large quantity of printed sheets of a more or less ancient date which they do not like to render unsaleable by revision until they have sold out a fair number of them. I was very much struck with what Sir Charles Wilson said about the system in other European countries, their having the manuscript map kept in the Town Hall in which corrections are put in very rapidly, almost within a week of their being made, and that any member of the public can see this, and can get a copy and use it for his own purposes. It seemed to me, at any rate, that for property purposes that was a much nearer thing to what was wanted than what we now have in this country, which is a most admirable map when made, but necessarily out of date in a very short while.

6007. (*Mr. Roby.*) That applies chiefly to the suburban maps, I suppose?—Yes, that is where you might call it a crying evil.

6008. And mainly to the large scale, not to the 25 inch would it? Does the 25-inch get out of date very rapidly, do you think, for your purpose?—In a suburban district it would apply, but for the plotting of suburbs you can hardly work on the 25-inch scale.

6009. (*Chairman.*) You said that that is one of the evils of publication; would you suggest that these large scale maps of England should not continue to be published?—It seems to me very likely that a more useful map for conveyancers would be the result of discontinuing the publication of the large scale map.

6010. And what are we to do instead?—Hand the existing maps over to the local authorities to be revised by them, ordinarily at very short intervals, those revisions to be corrected by the Ordnance Survey at longer intervals, and any member of the public to be entitled to a tracing or copy of that map at cost price.

6011. (*Mr. Mather.*) Would those maps be held and supplied to the public by the Ordnance Survey Department or by the local authority?—I should suggest by the local authority.

6012. Then the local authority would simply employ the Ordnance Survey Department to correct their own work?—Yes.

6013. But they would prepare, publish, and revise the maps?—Not publish, but they would prepare and revise.

6014. And keep the maps ready for the public?—Yes.

6015. (*Chairman.*) In fact, you would assimilate our practice to that of the continental nations?—Only as to the very large scales.

6016. (*Mr. Roby.*) Do you mean the 5 and 10 foot?—The 5 and 10 foot.

6017. Or the 25 inch also?—In country districts the 25 inch.

6018. (*Mr. Mather.*) The 25 inch in the country would be chiefly serviceable in connexion with the villages and hamlets, the small communities; revision there would have to be taken from time to time?—Yes, principally.

6019. Then you mean that the local authority in the country—the county council—must be under the obligation of keeping up the maps on the 25-inch scale in connexion with their villages and small towns and hamlets in the same way that the local authority in the towns would do?—I originally suggested only roads in the country.

6020. Yes, but I put the question now in relation to these small villages which frequently alter; would you enjoin upon the local authority—the county council—the duty of doing for the villages and hamlets what the local authority in towns would have to do for the towns or cities?—I think that if small village holdings of land became very common it would be a useful thing, but as long as villages are practically in the hands of the larger landowners, and are only let out for small occupation tenancies, I do not think that it would be of very much moment one way or the other from a conveying point of view.

6021. There are many villages now enlarging of course all over the country; take a place like Harrow

now, for instance?—That is almost a suburban matter, I should call that a suburban question.

6022. Take the town of Watford beyond?—That is hardly my notion of a village.

6023. That you would call a town?—Yes.

6024. Although it is under the county council?—Still it is not a village.

6025. It would involve a considerable amount of work, would it not, to the county council to attend to, especially in counties where the extension for reservoirs and small manufactures is carried on?—Yes; but wherever that was the case the use that would be made of the map would be likely to repay the trouble.

6026. So that it would justify it?—So that it would justify it.

6027. That suggestion would make no difference to your proposals; you would still have it done by the county council authority?—Yes, I do not think it does make any difference.

6028. (*Chairman.*) In Middlesex and Yorkshire there are registries of deeds, are there not?—Yes.

6029. Is the Ordnance map used in connexion with these registries in Middlesex and Yorkshire?—No. No map is used in those Registries at all.

6030. How are their deeds indexed?—The deeds are indexed by parishes and within the parish by the names of the parties to them. The result of that is, that where the same man has a great many dealings with land, in the same parish, in the course of a short time the index gets into such a state of confusion that it is practically useless to attempt to make a search. Also in the case of very common names the same thing happens in Middlesex and in Yorkshire. The principal reason why the system of registration of deeds has not realised what was expected of it (in modern times at any rate) is the state of confusion into which the index gets, in my opinion owing to the want of a map basis. The parish is altogether too large and the habit of granting building leases in hundreds by the same person to the same person makes a search in the index against either quite an impossible thing to undertake in any small transaction.

6031. (*Mr. Roby.*) You say parishes, do you mean the old parish?—The old large civil parish.

6032. (*Chairman.*) You think the Ordnance map could be usefully introduced in these county registries?—I think if it were to be kept up in some such way as I have suggested, or in any other efficient way, it would be exceedingly useful, because it would break up the parish area and enable deeds to be registered according to either blocks or conventional areas, formed by vertical and horizontal lines.

6033. In France, apparently, they are obliged to break up their registry into blocks?—So far as I know, the Middlesex and Yorkshire deed registries are the only deed registries in existence in which a map is not an essential part of the system.

6034. Ours has completely broken down?—The system of registration of deeds breaks down on that ground.

6035. Does the colonial system?—I think the experience of colonial registries just shows this: that where land is not fenced the surveying of it for registration purposes is an exceedingly nice matter, but that where land is fenced you can rely upon the fences not being mistaken, and a few feet one way or the other is not of such supreme importance. But in the Australian registries, where they have a fund to compensate for mistakes, and where there is a great deal of absenteeism and a great deal of unfenced land, the principal losses that they have suffered have been owing to the wrong measurement of areas by local surveyors, and the roughness of the original Government survey. In England the only place where we are exposed to that risk is in the formation of fresh allotments, and in the sale of land before the fences are erected, and the colonial experience would show that great care is necessary in all cases of that description, but that where the fences exist on the land at the time of the conveyance, exact accuracy is not a matter of such moment.

6036. How were their maps made in Australia, do you know?—There was a Government survey for the purposes of colonization. Every Government grant of

Mr. C. F. Brickdale.

9 Aug. 1892

Mr. C. F.
Brickdale.

Aug. 1892.

land has a map on it, but the map is an exceedingly elementary thing. It is generally just a square with immense distances marked against each side, numbered with reference to a block, and sometimes with a road or a spring or some other similar detail inserted.

6037. (Mr. Roby.) Defined by reference to latitude and longitude?—I think they are defined generally by

reference to a collective list of such maps which there is in the capital.

6038. (Chairman.) To fit into some triangulation?—Yes, it fits into a triangulation or a system of square blocks.

6039. That concludes the questions, is there anything else?—There is nothing further that I have to say.

The witness withdrew.

Adjourned.

Board of Agriculture, 3, St. James's Square, S.W.

EIGHTEENTH DAY.

Saturday, 12th November 1892.

PRESENT:

SIR JOHN EDWARD DORINGTON, BART., M.P., THE CHAIRMAN, PRESIDING.

Sir ARCHIBALD GEIKIE, F.R.S., F.G.S., LL.D.
Lieut.-Gen. ANTHONY CHARLES COOKE, C.B., R.E.
Mr. HENRY WILLIAM PRIMROSE, C.S.I.

Mr. WILLIAM MATHER, M.P.

Mr. CHARLES FORTESCUE BRICKDALE.

Major D. A. JOHNSTON, R.E., *Secretary*.

Major-Gen.
Owen Jones.

Major-General OWEN JONES called in and examined.

6040. (Chairman.) General Jones, you were employed on the Ordnance Survey?—I was in charge of the boundary branch of the Ordnance Survey, and previous to that was in charge of the detail survey of Denbighshire.

6041. During that time the question arose as to the proper writing of Welsh names, I think?—Yes, I was in charge, I may say, of the detail survey of Denbighshire.

6042. Had you anything to do with the selection of Mr. Rowland as the corrector of Welsh names?—Yes, he was recommended by me, when I was leaving for Ashantee. It was necessary to have somebody appointed. He had assisted me often; he was a recognised authority; but he is now dead. He was author of a Welsh grammar and of various other Welsh books.

6043. He was author of a grammar and of various Welsh books?—Yes.

6044. Was he looked upon as an authority in Wales?—One of the first, I should say.

6045. Do you yourself speak Welsh?—I used to speak Welsh as well as I do English.

6046. You are thoroughly acquainted with the general structure of the Welsh language, and with the mode of writing it?—I am, of Welsh names.

6047. It has been represented to us that the names on the Welsh map are very frequently mis-spelt, and I may say, misconstrued?—Well, that may be in the way they are supplied when collected. Mr. Rowland probably had not the name properly submitted to him.

6048. That is quite likely?—Yes, there is no difficulty whatever in writing a name etymologically correct; but it is difficult without local knowledge when the name is submitted in a corrupted form, with the names of the authorities for this spelling, to judge how far the corrupted form has become locally established, and in the case of the name of a house, whether the orthography can be corrected without offence to the owner or occupier.

6049. We have had here—Mr. Evans has sent to us—a list of names on sheet 249, which he thinks are mis-spelt; have you got that sheet before you?—Yes. I see that two thirds of it is in the English county of Monmouth, and one third of it in Glamorgan.

6050. Now the first name objected to is spelt upon the map with a "p" for pont and two "d"s at the end of Newydd?—Yes.

6051. Do you think that is correct?—Quite correct. What Mr. Evans proposes by putting a single "d" there; it is a delta he puts to express "dd"—a soft "th."

6052. Now is the Greek delta commonly introduced in writing Welsh?—In manuscript it sometimes is.

6053. Would you see it in a newspaper?—Oh, never.

6054. It is rather what I might call a doctrine of perfection?—Yes.

6055. Are scholars usually adopting it?—I am not aware of it. A few may in correspondence, I have a letter this morning from my Welsh gardener; he certainly does not use a delta—there are more than a dozen instances of "dd." Here also is the Welsh notice of the Merionethshire County Council for November; there is no instance of the delta being used, it is always "dd."

6056. (Sir A. Geike.) But may I ask is it the case that in the old manuscripts the delta is used?—Oh, no.

6057. Surely the delta is a modern introduction?—Well, modern; in some old manuscripts you will find some characters used, but they are always given up in ordinary printing.

6058. Yes; but the point I want to know is this, the delta which we are recommended to use for the double "d" occurs in modern manuscripts; but it does not occur does it, in the old manuscripts?—I am not sure of it.

6059. I do not know myself; it occurs to me that it is a comparatively modern introduction into manuscripts?—You see how impossible it is to follow the delta, because here is a type-written copy, and there is hardly one of them correct; it is put as a single "d" here.

6060. (Chairman.) But Mr. Evans has written to us calling our attention to the way in which we have spelt in our print the corrections which are supplied to us in manuscript?—Yes. In sheet 249 there is the sheet; you see this is the county boundary of Glamorgan, two-thirds of this is in the county of Monmouth, and I should expect in this part of Glamorgan and of Monmouthshire lots of corruptions in names of houses and places, and locally well established, which Mr. Rowland would be unable to alter on the Ordnance sheet.

6061. He suggests also that in addition to the Greek delta you should use D with a dash across the tail of it?—Yes; nobody could describe it, because nobody would use it in ordinary printing.

6062. Nobody would use it in ordinary printing?—No.

6063. He recommends also that the capital IL should be introduced with the dash across it, and that those other capitals which I now show you should be crossed?—Yes.

6064. You think they are not used in newspapers in ordinary Welsh writing?—Certainly not.

6065. He says, "I would follow the authority of our old manuscripts, and adopt an IL of that form"?—Yes; writing two "ll's" approximately as one "l." Wherever the two "l's" are used in Welsh it is at once known to express one single sound—one single letter.

6066. But that is not usual in Welsh printing?—Oh, no; certainly not. You would have a separate type, which few would be able to read, and no newspaper would go to the expense of it.

6067. You say two "l's" represent one single sound; but do they represent one single sound?—It approaches the aspirate "l" through the side of the mouth. I always use the right side; some people may possibly use the other side. It is as easy a sound as any other to a Welshman.

6068. (Chairman.) Should "f" be represented by "v"? It is against the general practice of the country, but I am aware that in certain manuscripts "v" has been used for the single "f," and "f" used for "ff," but Mr. Evans, while advocating "v" for "f," adds that "care should be taken to use "ff" for the sound of "the English 'f'." His proposals would satisfy no one and would give rise to objections on every side.

6069. But you as a Welshman would not recommend such a change as substituting the "v" for the "f"?—No.

6070. It would be unusual; not in accordance with ordinary practice?—It is against the ordinary practice I certainly would not recommend a "v" for the Welsh "f" sound and that two "ffs" should be written for the English "f" sound.

6071. (Sir A. Geikie.) Well, are these names as spelt on the Ordnance map spelt in the same way as you would find them spelt in a modern Welsh newspaper?—Certainly.

6072. Are they spelt in the way in which people write them when they are addressing their letters?—Yes, but some people introduce "v" into the names of their places. An English friend of mine who lives at Plas-yn-Vivod spells the name of his place with a "v," but if you want the correct Welsh it would be Meifod; the township name is Meifod, or it might be correctly written as Plas-yn-y-Feifod.

6073. That gives it the "v" sound?—Yes.

6074. It is the same in Gaelic and in Irish the same change?—Yes, but there my friend insists on having his house spelt with a "v" and we are bound to follow it, and he inserts "i" instead of "ei."

6075. (Chairman.) I think it is reasonable that persons should be desirous that the names of their houses should be spelt in the way in which they have been in the habit of spelling them, rather than in what a purist might call the correct Welsh form?—Rather than in what a purist might call the correct Welsh form. Certainly for names of houses; but if the names referred to woods or features I would say I will see the ground first; I would say it is a wood and all the district tell me it is called so and so. I have very seldom found a difficulty; but where I have found a man who wants a part or spot spelt in such-and-such a way, my authority is the Welsh farmers in the neighbourhood who have given me such-and-such a name.

6076. (Mr. Mather.) Can you tell us why these serious complaints concerning the Welsh names have been made if the system hitherto carried on has been one very carefully considered. How have so many errors crept in?—Well, I think it is very unfortunate that the only map that has been brought to my notice is one in which two-thirds are in an English county, and I certainly never heard when I was in North Wales—and I live in Merionethshire myself—I never heard these complaints.

6077. (Chairman.) Mr. Evans objects to the double use of "th" for certain sounds, and he says that the "th" in those two words there are intolerable?—They are offensive to a Welshman's eye; but these are parish names that are certainly so well established that if you turn to any Clergy List you will find those names written in this way; we cannot alter them. Here

is that first name you showed me. We cannot attempt to correct the village name, a well-established village; they are also similarly spelt in this Parliamentary return for the Commutation of Tithes.

6078. I dare say the other names are the same?—The names Llanthewy, Llandegveth, and Lisvane, which Mr. Evans says are intolerable in Wales, are so spelt in the Clergy List. They are clearly established, I should say.

6079. In the official list of parishes in the Clergy List they are spelt in the manner they are in the Ordnance map?—Yes.

6080. (Mr. Mather.) Do you think that the Clergy List is made up from your Ordnance map?—No, I do not.

6081. And therefore the supposed errors are repeated there?—No; I fancy they are supplied by the clergyman of the parish; but the Clergy List is only one of many authorities we consult for our parish names.

6082. (Chairman.) They represent the parish spelling?—Oh, certainly; and for a long period.

6083. Then with regard to the other corrections of sheet 249 of Monmouthshire that Mr. Evans desires to make, your opinion would be that he is right or that he is wrong?—For instance, take the first few names. Pont newydd; I would not alter it to Bont if locally collected as Pont; one of them is a village with two railway stations written as Pontnewydd and Upper Pontnewydd in the Railway Guide.

6084. And your next name Daren, he puts two "r"s in it?—Well, he doubles the consonants in the next name. Most of the dictionaries do not. Dr. Owen Pughe, one of the biggest authorities, spells it with one "r." This is a little dictionary here, which writes it with one consonant.

6085. You would say that the second name in which he doubles the consonant is spelt with a single consonant in the dictionary which I show you?—Yes.

6086. The second name in which Mr. Evans doubles the consonant is spelt with a single consonant in the Welsh dictionary now in my hand?—There it is Taren, the middle form is Daren.

6087. (Lieut.-Gen. Cooke.) Is the dictionary a good one?—I believe so; Dr. Owen Pughe's can be brought from my office in a moment.

6088. Is it spelt the same way in his?—Yes.

6089. Dr. Owen Pughe, who is a high authority, gives it in the same way in his dictionary?—Yes.

6090. (Chairman.) Mr. Evans has got a double consonant in No. 3?—The same thing again. What he says is that the English "barren" might quite as well be spelt with a single "r." Here is a printed list of a few names constantly coming into the names of places which Mr. Rowland got out for examiners. It is spelt there as a guide. A few of those Oxford scholars write them all now with double consonants.

6091. Three?—Three is also spelt in the same way in the dictionary.

6092. No. 3 "Careg," a stone, is also spelt with one "r"?—Careg, a stone, is also spelt with one "r."

6093. And No. 4?—No. 4, Bargoed, Mr. Evans derives from some king, and states that the name should be Bargod. I fancy the derivation is Byrgoed, "stunted trees." In any case the name is locally established as Bargoed, is so written on the Survey plans, and is the name also of the railway station in the railway guide.

6094. (Sir A. Geikie.) You believe the duty of the Ordnance Survey is to represent the name as it is pronounced by the people; whether it is a corruption or not?—Yes, of a house if locally established; but if I found a wood or the side of a hill, or other feature, I think it ought to be spelt correctly.

6095. Quite so; but suppose you are not quite sure about the derivation, do you not think it is a safer thing to give the sound?—Yes, but Welsh names are easier than English names, as the Welsh names are generally descriptive.

6096. Here is a case in point; you yourself and Mr. Evans have come to a different conclusion as to the meaning of the word; would it not be better to spell the word as it is locally pronounced?—Yes; therefore we find it here in some corrupted form and we have not attempted to correct it.

Major-Gen.
Owen Jones

12 Nov. 1892.

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6097. (*Chairman.*) Then the next seven or eight names; do you want to make any remark about them?—I see nothing to object to in No. 5. 6, Gwrhay, is the established name of a district and colliery and cannot be altered to Gwrhai, as Mr. Evans suggests. 7, 8, and 9 are written on the map as locally established, and I would remark that the insertion or omission of the article in the names of places is equally correct. Craig-cnwc and Craig-y-cnwc are equally correct for the name of a farm. We take what is established. This refers to a large number of Mr. Evans's remarks, 14, 33, 34, 37, 42, 45, 47, 49, 54, where the map is correct. I am also inclined to think that 10, 11, 15, and many others will be found locally in a corrupted form, and were so established previous to 1833, when the old 1-inch map was published, and that the orthography should not now be altered although it is evident that it is wrong etymologically. 12, Pont-rhyd-yr-ynn should terminate with "nn," but this is not the local practice; and there is the railway station name. 13, Glascoed is correct and Mr. Evans wrong for the name of the house (see note to our Rule 5). 18, Guernau-ganol, Mr. Evans is wrong, as the adjective refers to a single farm. 29, I have a letter from the owner of Llanbradach (a Miss Morgan) who states that she never heard of it as Glan Bradach, so that we cannot adopt Mr. Evans's suggestion. 36, the termination "an" is an evident misprint for "au."

6098. Perhaps you would summarise your criticism of the rest of the names. No. 13, you remark Mr. Evans is wrong here?—Yes, when applied to a house; the name I have found to be Glascoed and not Glasgoed in numerous districts.

6099. Then you make a remark on No. 18?—Yes, you know it is the commonest thing for a single house to be called "The Oaks," or "The Beeches." Mr. Evans wants this farm to be considered plural, and objects to the adjective being singular. I know he is wrong.

6100. In this case, No. 18?—The adjective is not, Mr. Evans says, mutated when used with the plural. I reply, but this is a single farm, the middle farm between two other farms of the same name.

6101. No 23?—Well, he wants the middle form of Derfel, and he is correct if the name is not locally established by the single "d," as Llanderfel. I think it would be well if the Committee had the parish name-book to see the authorities for these names; on referring to the old 1-inch maps published in 1833, I find the same spelling there.

6102. As to No. 33, you are inclined to think that both forms are correct?—Yes.

6103-4. Both Mr. Evans's and the map-form are correct?—Yes; and you might say the same as to 34, but the map is wrong, and Mr. Evans is correct in 17, 21, 23, 28, 35, 61, and 62. In No. 41 the name on the map is correct as Croes-y-mwyalch, and not as stated to be Croes-y-mwyalchen.

6105. Can you say anything about No. 32, which is stated to be an impossible word?—Well, I should say it was Gelli-fanadlawg, a grove abounding with broom. If you look in the dictionary you will find the word "Banadlawg," but the map name is a corrupted form; but I have no doubt it is established.

6106. You would say this is no doubt a corrupted form?—Yes. I think the owner should be asked to write if Gelli-fanadlog. Then there are those other names, 33, 34, and 37; they are all, I think, quite correct in the map. The insertion or omission of the article in place names is the commonest thing imaginable in Welsh names.

6107. The form of which he complains is a very common form in the Welsh names?—Yes.

6108. (*Lieut.-Gen. Cooke.*) You do not mean that it is strictly correct, but it is in practical use?—Oh, yes, it is correct; I will show it you in our rules. If Mr. Evans were here I would convert him at once on points I am referring to.

6109. (*Chairman.*) Have you seen Mr. Williams's evidence which was given before us?—No, I have not.

6110. Would you look over that table which he gives?—I am inclined to think that he has probably good grounds for his corrections; the map names and the names supplied by Mr. Williams are correct Welsh, but have different meanings. Without my having been on the ground, I consider Mr. Williams's names to be generally correct; but take an instance: our name, Muriau'r-gwyddel, is correct Welsh. Mr.

Williams states it should be Muriau'r Gwyddil. I suppose he has been to the place, that he has actually found this to be the name, so the name was badly supplied or badly collected.

6111. These difficulties, I suppose, naturally arise when people who do not know Welsh collect Welsh names?—That is what it is. Here is the name, Tan-ty, he says the name of the house is Pandy, the fulling mill; but there are two names which would reflect on the final Welsh examiner. Bewdy-newydd and Pant-y-mewsydd, these must, I think, be due to errors in publication, as they are evident errors, and are intended for Bendy-newydd and Pant-y-meusydd.

6112. Would it be a difficult matter to correct the map—to go all over the Welsh names again?—Now that a copy of the map is published, it is easy to have the Ordnance Survey maps and names exhibited in the locality; in the first collection of names, the collector of names may have had supplied to him wrong names, but the errors are, I should think, due to the names not being collected by Welshmen.

6113. The great difficulty of the collection of Welsh names is that Englishmen collect them?—Yes, and when they were submitted to Mr. Rowland afterwards they were not put in the right form.

6114. He has not got hold, in fact, of the right form?—No.

6115-6. (*Sir A. Geikie.*) Without reference to the ground, you see nothing to object to in Mr. Williams's corrections?—No; but our rules as to the use of hyphens and capitals in place names have not been seen by him, and he has not considered our directions. I think on reflection he would agree with our rules, that Pen-y-foel for the name of a house should be distinct from Pen y foel when applied to the top of a hill.

6117. (*Chairman.*) You produce a book of "Instructions to Field Examiners on the Orthography of Welsh Names," with rules for compounding, initialling, and accenting under various conditions?—Yes.

6118. By whom was that drawn up?—By Mr. Rowland and myself. It was signed by us at the end of the rules. It would be more correctly described as Mr. Rowland's instructions to the difficulties suggested by me that our men would meet with in writing Welsh names. The names on the maps are generally in accordance with those directions, and the directions are followed by a list of the words which more frequently occur in the composition of place-names.

6119. They contain a vocabulary of the more common-place names directing that they shall be so spelt?—Yes, I see no objection whatever to a single correction Mr. Williams has made here.

6120. You think he is right?—I presume he is right, as he has been to the ground; but I can see at once that they are quite distinct names. If he knows these places they mean different things.

6121-2. You think the names on the map then are wrong?—They are different names, and a few are apparently wrong.

6123. Then instructions are given as to the different rules of Welsh orthography and grammar as applicable to names likely to be found in Welsh localities, and rules are laid down for the guidance of the Ordnance surveyors as to the adoption of local variations from pure Welsh names when they appear to have been accepted in the country?—Yes.

6124. Amongst those instructions it is laid down in Rule 15:—

"(15.) When names have assumed a corrupted form, which is thoroughly established, their orthography should not be altered even when they are known to be etymologically wrong:—

"*Hylas* (in Parish of Rhuddlan) for *Heol-las*.

"*Glan-hafon* (in Parish of Llanrhaidr) for *Glan-afon*.

"This will often apply to place-names in an English or partly English district:—

"*Landore*, for *Glandur*; *Abërdare*, for *Aberdar*."

"To prevent questions and to show that the examiner has noted the wrong spelling, he should add in column 2 of Object Name Book, the original name, e.g.:—

"*Glan-hafon* (established, corrupted from *Glan-afon*)."

You are rather inclined to suggest that a proof copy should be sent to the clergyman of every parish, and

that he should be asked to go through it?—Yes, in his particular parish; and that the names should then be submitted to some Welsh authority, who would secure uniformity in the use or omission of hyphens, and be in conformity with some sort of rules like those, so that there would not be a different practice in each district. I suggest, as a matter of correction of the names, that a proof copy be sent to the clergyman of each parish asking him to look over the names of places in his parish, and to state what corrections, in his opinion, are required. There is also another way: that it might be sent to the assistant overseer of each parish, who knows each place well.

6125. (*Lieut.-General Cooke.*) He is not a scholar, I suppose?—He reads Welsh, or knows someone to refer to. No one person in the county would have the local knowledge necessary for dealing with the Welsh names in the various districts.

6126. (*Mr. Mather.*) The recommendation would be, not that the county council should be the authority, but that they should nominate some one having local knowledge to do the work?—You would do it much quicker and save a lot of labour by sending it by post to the rector or assistant overseer of the parish who generally knows each farm and each house there. On his pointing out an error, your centre authority would communicate with him and investigate it.

6127. You would do it from the department, you mean?—Yes.

6128. (*Mr. Brickdale.*) But at an earlier stage every name has three authorities; could it not be that one of these three should be in every instance the clergyman of the parish?—The work has been done. It is a question of revising the work done, with the assistance of the published map.

6129. (*Mr. Mather.*) May we take it that the difference between you and Mr. Evans is that he is dealing as a scholar with what you call classical Welsh, and

you have dealt with modern Welsh in putting names into your Ordnance maps?—No; I think it is a new fad to introduce distinct letters for the map of Wales.

6130. (*Chairman.*) I should like to ask one more question. Since the publication of the 25-inch and 6-inch maps of Wales, have you found many complaints?—Not in my county. I could tell you which names were wrong and which were right in my particular district.

6131. What is your district?—Bala, Merionethshire.

6132. Here is IV., N.W. of Merionethshire?—I do not know this Ffestiniog district, but I see only three alterations by Mr. Williams. He inserts the article before Allt fawr. We on the map only use the article where there is no adjective or anything else to the name, as in Y Llyn, Yr orsedd; in other cases we omit the article as not necessary on the map.

6133. In this case you drop the article?—Yes. Well, the next one is Llyn-Iwerddon. Well, that is not wrong. The name for Ireland is Iwerddon and not Werddon. Certainly the map is right in both those instances, I should say.

6134. (*Sir A. Geikie.*) This one here, Foel farlwyd, is that correct?—Well, we frequently add the adjective form to a noun and write Foel Farlwyd, or it might be written Moely Barlwyd.

6135. Is it the "f" or the "m" which is correct?—If you put "m" there and write Moel it would generally be followed by a "y," or you must write Barlwyd. I am speaking generally without knowing this hill.

6136. (*Chairman.*) If General Jones would give us a memorandum as to what he has learned in Wales as to the view which is taken of our map we should be glad to have it?—Yes.

6137. Whether he has heard any complaints from the people who practicably use the maps in the district?—Yes.

The witness withdrew.

Adjourned.

General Jones has since forwarded a letter he received from the County Surveyor for Denbighshire, giving his opinion as to the Welsh names on the Ordnance Survey Maps. (See Appendix XIX.)

Sir C. Wilson.
Written
Memoranda.

MEMORANDA

By Col. SIR C. WILSON, K.C.B., K.C.M.G., F.R.S., DIRECTOR-GENERAL OF THE
ORDNANCE SURVEY,

On certain Points referred to him.

ERRORS ALLEGED IN ORDNANCE SURVEY.

REPLIES by the Director-General, Ordnance Survey, to questions on certain points referred to him by the Committee.

A great point has been made by several witnesses of the errors that are stated to exist in the maps and plans of the Ordnance Survey. The errors pointed out in evidence, many of them of old date, have as far as possible been investigated. In most cases they are either not errors at all, or are matters of opinion. The errors actually discovered are for the most part draughtsman's or engraver's errors, similar to mis-prints in books that have been passed by the "reader" when correcting proofs. No serious error of survey, either of commission or omission, has been brought to notice. The Department knows that in carrying out a work of such magnitude errors are unavoidable, and it is always glad when they are brought to its notice. Such errors are at once corrected on all MS. documents and plates, so that they may be eliminated from future editions.

It is a curious fact that the errors referred to by the witnesses have never previously been brought to the notice of the Department, which can scarcely be expected to search for errors made in some cases 40 years ago, before the maps are regularly revised.

It would have been a fair question to ask whether the Department has ever refused to investigate errors pointed out to it, and to correct them when necessary. I cannot find that it has ever refused to do so.

6th August 1892.

Q. 699-706 and 740. Mr. Crook has quite misunderstood my statement with regard to the revision of the one-inch map. My statement was to the effect that the new series one-inch map could be revised for 2,000*l.* a year in addition to the sum now being spent upon it. There was no question of revising the old one-inch map, or of producing a new one-inch map, by a plane table survey: that would have cost very much more than 2,000*l.* a year. The Director-General had no authority to undertake the revision of any map on any scale in Great Britain before December 1886, and could not therefore have commenced the revision of the one-inch map before that date. The revision of the published one-inch outline sheets of Lancashire and Yorkshire will be carried out as soon as the reductions from the 25-inch survey now in progress are made. In Ireland, where revision has long been authorised, the revision of the one-inch map has followed upon that of the six-inch. The Director-General have frequently urged the necessity for revision, and the subject has been mentioned in the Annual Reports, but no action was taken until December 1886.

Q. 707. I never made any statement with regard to the cost of a map made by plane table such as that apparently attributed to me. I stated that the delay in producing the new series one-inch map was due to the order directing its reduction from the cadastral survey: and that it would have been produced sooner if other methods had been adopted. I gave no estimate of cost, and have never made one. It would certainly have been very considerable. I then proposed to revise the one-inch new series maps without waiting for the revision of the $\frac{1}{25000}$ maps, and stated that this could be done for 2,000*l.* a year in addition to the sum now being spent on it.

Q. 709-720. Mr. Crook brings charges against the Directors of the Survey of having made changes in the system of numbering the one-inch sheets which have tended to

mislead and deceive the public, and that they have taken credit in the Annual Reports for doing work which they have not done. This matter is capable of a simple explanation.

In 1870 the one-inch map of England, as then ordered, was completed. Part of this map was based on a two-inch survey, and published in sheets on different meridians, whilst the northern portion was based on a six-inch survey as regards Lancashire and Yorkshire, and on a 25-inch survey as regards the four northern counties. When the $\frac{1}{25000}$ scale was definitely adopted for the cadastral survey, and it was decided to produce the one-inch map from it, it was decided to refer the one-inch sheets to a common meridian, and to adopt the Irish system of publishing the one-inch quarter sheets in two forms—outline, and with hill features. These quarter sheets were numbered 107 N.E., N.W., S.E., S.W., &c., but they formed part of a "new series" based upon large scale surveys, and constructed on a common meridian. The index in the Annual Report shows the southern limit of the "new series" sheets.

In 1870 the War Department being satisfied with the one-inch map, as then completed, transferred the Ordnance Survey to the Office of Works; but in 1872 they requested that a new one-inch map of the south of England might be produced by reduction from the cadastral survey. It was never intended to publish a new one-inch map of those districts in the north which had been published in outline, and with hills, as part of a "new series" from six-inch and 25-inch surveys. The intention was, and is, to revise the copper plates of those sheets. When the new one-inch map of the south of England was commenced it was decided to construct the sheets on the same meridian as the northern sheets, and to publish them in the same style, so that eventually there should be a uniform one-inch map of England, in outline, and with hills, on one projection. An index map was prepared showing the sheet numbers of the map as it would eventually appear; and the quarter sheets in the north of England were re-numbered so as to fall into their proper position. The index map, with the new sheet numbers, first appeared in the Annual Report for 1873 with the heading "New Series." It was afterwards considered desirable to make a marked distinction between the areas based upon a two-inch survey and those based on surveys on larger scales, and also between the areas published on the new system in quarter sheets in outline, and with hills, and those published on the old system. Consequently in the Annual Report for 1880 the total area published on the new system was given. It seems to me that the change was a natural and a desirable one; but it would perhaps have been better if attention had been drawn to it in the Report.

Q. 743. There is not the slightest reason to suppose that the Treasury will stop the completion of the engraved one-inch map. The Treasury have always held the view that the one-inch map, which is the standard map of the country, should be completed in the best possible style.

Q. 766-768. Attention is called to Sir Henry James estimate of 1862, that the cadastral survey could be completed in 21 years for an annual grant of 90,000*l.* The Treasury called for a report on this point in December 1877, and General Cameron forwarded a report on the 5th January 1878, of which a copy is annexed. From this it appears that Sir H. James' estimate was based on the survey of open country, and did not take into account the very close areas of the south and centre of England, or the rapid growth of the towns. General Cameron furnished a new estimate which has not been exceeded.

GENERAL CAMERON'S REPORT ON SIR H. JAMES' erroneous estimate in 1862.

COPY OF MEMORANDUM by Lieut.-General Cameron (Director-General), dated 5th January 1878.

With regard to the date of completion of the survey, no one can regret more than I do that the expectations held out by my predecessor in that respect will not be fulfilled. I am quite aware that even so late as 1870, when this Department was transferred from the War Office, and when it was known that we had been working at higher rates of cost than those contained in the estimate of 1858, Sir Henry James maintained that the balance would be restored when the survey should reach an easier part of the country; but this was clearly too sanguine a view of the case. The country surveyed between 1858 and 1870 was by no means more difficult on an average than the remaining parts of the country. The fact is that the rates entered in the estimate of 1858 were based on the experience gained in the survey of portions of the four northern counties of England and of the south of Scotland, which were the only parts of the kingdom surveyed at that time on the $\frac{1}{25000}$ scale, and it is abundantly proved that while these rates might answer for the purely agricultural counties, they are wholly inadequate when applied to the more populous districts, and still more so in the mining and manufacturing districts, which abound in large towns and villages.

The estimate which I sent you to enable the First Commissioner to answer a question in the House of Commons was founded simply on our experience of the last two years. I have subsequently checked it by the experience of the last 19 years, the whole period during which the cadastral survey has been in progress.

During that period we have surveyed in England only, on the $\frac{1}{25000}$ scale 19,013 square miles of country at a cost of 958,745*l*.

On the 1st January 1877 there remained to be surveyed on the $\frac{1}{25000}$ scale (not including Yorkshire and Lancashire, which were surveyed previously to 1858 on the 6-inch scale) 29,346 square miles, which at the same rate will cost 1,479,794*l*.

Adding a sum of 84,000*l*. for completing work estimated for in Scotland and Ireland, and a further sum of, say, 200,000*l*. for the cost of the work which will have to be done after the field survey is finished (including plotting, examination on the ground, drawing, zincographing, engraving, &c.) the total sum required to be provided from the 1st January 1877 would appear to be 1,763,794*l*.

I believe, therefore, that my estimate of from 1,800,000*l*. to 2,000,000*l*. is an ample one, and that the work should be done for the smaller sum.

In 15 years from 1877, or in the year 1892, the annual votes for the survey would be sensibly diminished, and become less and less each year, until the whole of this gigantic undertaking is wound up.

I may add that as regards Scotland the estimate of 1858 has stood wonderfully well, and there will be no sensible excess.

The cadastral survey of Scotland will be completed this year, and there will only remain the sketching of the hills and the engraving of the 6-inch and 1-inch maps to complete the Ordnance Survey of that part of Great Britain.

(Signed) J. CAMERON.

5th January 1878. Lieut.-General.

Q. 769. The rapid publication of the *carte vicinale* of France, is compared with the slow publication of the one-inch. The circumstances are entirely different. The *carte vicinale* is produced by photographic reduction from a published map, the $\frac{1}{50000}$ staff map of France; and sundry statistical information has been added to it.

Q. 775-787. It is stated that when the House of Commons voted a sum of money for the completion of the cadastral survey by 1890 the members understood that Lancashire, Yorkshire, and the Scotch counties on the six-inch scale were included, and that Mr. Shaw Lefevre, the responsible minister, so understood it.

In the report of the then Director-General, submitted with the estimate for the completion of the cadastral survey by 1890, it is clearly laid down that the counties referred to were not included. That this was the case is clearly shown by the Return to an Order of the House of Commons, dated 7th July 1881. In this return Lancashire, Yorkshire, and the six Scotch counties appear in the list of "Counties of which Ordnance Maps on the enlarged scale "have been issued," and it is stated that "the counties to "the south of Yorkshire and Lancashire, which were only "mapped on the 1-inch scale, are being resurveyed for the

"25-inch scale." (Section 1.) The "6-inch" counties do not appear in the list of "Counties of which Ordnance "Maps on the enlarged scale (25-inch) are in process of "being made," or in that of "counties of which the "Survey on the enlarged scale has not yet been com- "menced, &c." A map is attached to the Return, showing the state of the publication in July 1881, and the dates upon which it was estimated that the maps on the enlarged scale would be completed for each county. Lancashire and Yorkshire do not appear on this programme. A map giving similar information was published with the Annual Report on the Survey for 1881. The responsible minister when the estimate for expediting the survey was authorised was Mr. Adam, not Mr. Shaw Lefevre. The instructions of the Treasury in 1880 with regard to the completion of the survey by 1890 did not contemplate that those counties which had been mapped on the 6-inch scale should be reproduced on the larger one. The Select Committee of the House of Commons, which reported in April 1862, resolved: "That it is desir- "able that the cadastral survey on the scales directed by "the Treasury Minute of the 18th May 1855, and recom- "mended by the Royal Commission of 1858, and again "directed by the Treasury Minute of the 11th September "1858, be extended to those portions of the United King- "dom which have been surveyed on the scale of 1-inch to "the mile only." This Resolution, which was adopted by the House of Commons, excluded the "six-inch" counties. The Treasury had therefore no Parliamentary authority to order a re-survey of those counties on the 25-inch scale. It was, however, within their power to order the revision of the counties on the 25-inch, instead of on the 6-inch scale, and this they did in December 1886.

Q. 788-795. Some incorrect statements are made with reference to the 25-inch survey of Ireland. It is true that I had frequently pointed out the necessity for a 25-inch survey to meet the requirements of the Irish Land Acts; but that survey was authorised in consequence of the action of the Irish Members in the House of Commons in 1887. It is not true that the money voted for England has been expended on the Irish survey. The survey vote was being gradually reduced, and the estimate for 1891-92 was ordered to be 210,000*l*. It was afterwards increased to 216,000*l*. for the special purpose of expediting the Irish survey. The proposed appropriation of the vote, which shows the amount intended to be spent on the Irish survey, is always printed with the estimates and laid before Parliament.

It is incorrect to say that the question was never brought before Parliament, and that no estimate was made for it. When the Government decided to comply with the demand of the Irish Members for a 25-inch survey, an estimate was submitted in the usual way to the Treasury.

Q. 801-805. See also Q. 1371. A difficulty is said to exist in obtaining six-inch quarter sheets contoured.

To expedite the publication of the six-inch map, the issue of two editions—one without, the other with contours—was authorised. It was at first intended to sell out the first edition without contours, before publishing the second edition with contours, but in consequence of a promise made by Mr. Chaplin in the House of Commons it was decided to publish the edition with contours at once. Contoured sheets of the whole country have now been on sale to the public for some months, and if the public cannot obtain them it is the fault of the agent over whom the Department has no control.

Q. 831-844. My statement with regard to hill engravers was to the effect that no assistance could be obtained from outside. Though the per-centage of engravers who try hill-engraving and succeed is small, it would be possible to train an additional number and expedite the completion of the new series engraved hill-map, if such a course be considered desirable.

Q. 848-852. My statement with regard to the sale of the maps covering the cost of production appears to have been misunderstood. It was to the effect that if all the maps, including the impressions in store, were sold, there would be a profit of 30,000*l*. to 33,000*l*. since 1858. That is, the sums received from the sale of maps since 1858, and the net value of the impressions in store, taken together, exceed the cost of publication by 30,000*l*. to 33,000*l*. My point was that if the maps had been used, as was intended when the survey was commenced, the stock would have been sold out, and there would in that case have been a profit; but the maps not having been so used there was an accumulated stock valued at 250,000*l*. As was pointed out at the time, much of this stock will eventually be condemned and the estimated profit will be largely reduced or extinguished. I never said that the sale of the maps covered the cost of production.

Q. 863-926. With regard to the limits of the $\frac{1}{25000}$ survey, the Treasury directions never contemplated the survey of the

Sir C. Wilson.
Written
Memoranda.

Sir C. Wilson.
Written
Memoranda.

areas that were not fairly covered with buildings on the large scale, even though they lay within a municipal boundary. If all areas within municipal boundaries had been surveyed on the $\frac{1}{2500}$ scale the greater portion of the survey work would have been expended on such surveys to the neglect of the agricultural districts. The instructions under which division officers lay out the limits of $\frac{1}{2500}$ surveys can be produced if required.

The statements made with regard to the cost of a $\frac{1}{2500}$ survey as compared with a $\frac{1}{5000}$ survey are erroneous. The survey of ground on such a large scale as the $\frac{1}{2500}$ has to be made with much greater care and accuracy than on the $\frac{1}{5000}$ scale; it is very far from being "only a matter of a little extra detail."

The charge of 15s. an acre is not excessive for a survey on the $\frac{1}{2500}$ scale, including as it does triangulation, levelling, surveying, and the drawing of the finished plan.

Q. 871-3, 881-2. The boundary of the large scale survey was laid out in 1887, at which time the bulk of the area for which the large scale is now claimed did not form part of Manchester. The various local authorities were consulted at that time, and except those of the City of Manchester, who asked for 207 acres additional of large scale survey, they all agreed to the limits adopted.

The application for the extension of the large scale survey of Manchester was only received by the Ordnance Survey on the 6th January 1892, by which time the field work on the 25-344 inch scale was far advanced.

Q. 905. My statement was that 15 to 20 acres of agricultural land could be surveyed on the $\frac{1}{2500}$ scale, for one acre of town land on the $\frac{1}{5000}$ scale; not that a $\frac{1}{2500}$ scale survey was 20 times the cost of a $\frac{1}{5000}$ survey of the same area.

Q. 912. The Ordnance Survey does not, as is suggested, receive any benefit from the sums paid by the towns for "out of turn," or "extension" surveys. The expenditure comes out of the survey vote, and the receipts are paid into the Exchequer. The question of allowing these receipts to be utilised in aid of the survey vote is now under the consideration of the Treasury.

Q. 928-937. My statement with regard to the location of the Survey Divisions has been misunderstood. The survey in Great Britain is organised in eight field Survey Divisions, and Lancashire and Yorkshire were parcelled out amongst these divisions for re-survey on the $\frac{1}{2500}$ scale. In this allotment, Manchester and the surrounding districts were assigned to Bedford. It was never intended that Bedford should be permanently charged with the revision of Manchester, as it will be the Division Head Quarters for the eastern counties.

Q. 979-986. The suggestion that there should be revision centres in the large towns could not be carried out without greatly increased expenditure.

Q. 979. It is stated that the Ordnance Survey of Lancashire is covered with mistakes; but only one error, in the spelling of a name, is pointed out.

Q. 981 and 1563. My statement with reference to the system of collecting names applied to the old and new names, and not, as suggested, only to the latter. The system is almost as old as the survey itself. It is remarkable that no one has previously called the attention of the Department to real and supposed errors in the orthography of the names of the Lancashire plans though they have been published for 40 years.

Q. 979. The name "Bogget's Hill Clough" on the 1-inch of Lancashire appears on the 6-inch map, and in the old object name book as "Boggart's Hole Clough," which is, apparently, the correct name. The error originated in the preparation of the 1-inch MS. plan, and would long ago have been corrected if attention had been called to it. It is a draughtsman's error. The name is correct on the 6-inch map and name book.

Q. 982. The name "Kinderscout" appears on the maps to the hill of that name. The name "The Peak" applies to a well-known district in that part of the country.

Q. 1002 and 1040. The complaint that coloured plans at a high price are supplied when uncoloured plans are required is probably due to the fact that it is to the agent's interest to push the sale of coloured maps, and that if a map is demanded without its being stated whether a coloured or uncoloured plan is required, the agent generally sends a coloured impression. The Department receives no benefit from the sale of coloured impressions; and has no control over the action of the agent.

Q. 1011. I know of no town in Yorkshire which is published partly coloured and partly hatched.

Q. 1016-1017. An unfavourable comparison is drawn between the price 10s. an acre charged for the extension of the $\frac{1}{2500}$ survey of Bury, and the price 15s. an acre estimated for that of Manchester. In the one case the ground was open, almost agricultural, and in the other it was partially

built over, and consequently more tedious and expensive to survey.

Q. 1018. No offer such as that alluded to was received officially or came within the knowledge of the Director-General. It appears that the offer was made to a subordinate employed on the survey of St. Helens. The tracing referred to was suggested to the borough surveyor on the usual terms of contract.

Q. 1037. This complaint does not in any way affect the actual accuracy of the plans. The objects mentioned are parts of the buildings shown on the plan, and are shown in accordance with the instructions issued to the field examiners of the survey.

Q. 1045, 1094. The plans produced by photo-zincography are unfavourably compared with engraved work. There is no process equal to that of line engraving, but it is costly and slow. It is a case of cheap and rapid production in an inferior style, good enough for all practical purposes, versus slow and costly production in a superior style. It would have been impossible to engrave all the 6-inch maps of England and the towns in a reasonable time and at a reasonable cost.

Q. 1064. Complaint is made of want of uniformity in the Ordnance Survey maps. Uniformity is no doubt desirable, but complete uniformity would mean that no changes or improvements were to be made in the style of the plans.

Q. 1066-7. The 10-56-foot scale plans of Eccles were published in 1890, and the 26-344-inch plans will be published before the end of the year. The work of Eccles is proceeding pari passu with that of the adjoining country. The delay in producing the new 26-344-inch map is due to the labour of reducing the large town areas in South Lancashire and Yorkshire.

Q. 1061. None of these parishes have been delayed. Their revision is being carried out with that of the adjoining parishes.

Q. 1074-5. This statement is incorrect and must have been made under a misapprehension. The new sheets of Worsley have not been filled up with the old survey of Eccles.

Q. 1074. It is presumed that this refers to a map prepared several years ago for the War Department. In this case, the hill shading of the old 1-inch was fitted on to the new outline with contours, the new hill sketching not being available. The map is not on sale to the public, and it has always been known that it was not quite accurate, although good enough for the purpose for which it was produced.

Q. 1107. There seems to be some misapprehension here. I do not recollect having ever made the statement attributed to me. Contours at 5-foot intervals have only been run at certain places at the request of, and for the confidential use of, the War Department.

Q. 1105-1211. It is unfortunate that the 6-inch and 6-inch maps are published on so many meridians, but the practical difficulties that arise from this are not really very great. The numerous meridians are partly due to the origin of the survey, and to the constant changes made during the "battle of the scales," and partly to the old view that the maps of each county should be complete in itself. During the later years of the survey it has been the custom to publish as many counties as possible on the same meridian. No change can now be made without an expenditure out of all proportion to the advantages to be obtained. It may be added that the "new series 1-inch" map when completed will give the whole of England on one meridian, and that for limited areas the 6-inch sheets can always be combined, as they have been in the case of the 6-inch map of London.

Q. 1212. Torquay was specially surveyed out of turn in 1892. It was decided that the complete revision of the town should not be made until the general revision of the published plans of the country took place. Other towns were in the same position as Torquay, and an exception could not be made in favour of that town. Torquay was only revised so far as was necessary to connect the old work with the 1888 survey.

Q. 1316. The statement about footpaths is incorrect. Footpaths are shown by single dotted lines on this and other sheets of the "Advance Edition." The cart tracks are shown by double dotted lines.

Q. 1238, 1324. It is said that no one knows the processes by which foreign maps are produced. They are known to the Department, and if necessary a statement of them can be prepared.

Q. 1325. My statement with regard to the amount of detail in England has been misunderstood. I never referred to hedges and other details which do not appear on the 1-inch map, but to the well-known fact that England is more cut up by railroads, roads, canals, &c. than any foreign

country, and is more covered by towns with large suburbs, country residences, villages, ornamental grounds, &c. All these have to be shown on the 1-inch map.

Q. 1371. Formerly all quarter sheets were printed on paper which had a yellow tone, and was very good printing paper. Complaints were made of the softness of this paper, and it was changed for a white paper for new editions. As the editions of the sheets sold out unequally, it was decided to supply white impressions specially when sheets were demanded for mounting. The agent was informed that this would be done.

Originally all quarter sheets had the houses in black. This was changed for ruling, and the whole of Gloucester should have been ruled at the same time. Probably the three ruled impressions were on white paper, and the unruled on the yellow. If the agent had called attention to this the discrepancy between the sheets would have been noticed. The S.E. sheet was a coloured one, not uncoloured as stated.

Q. 1372. The statement that the 6-inch plates cannot be altered is incorrect. As a matter of fact they are altered for new editions. All contours in the original engraved plates of Lancashire and Yorkshire appear on the revised 6-inch quarter sheets published by photolithography.

Q. 1400-1424. It is stated that the 4-mile map of England issued this year is the 4-mile map intended to be published. This is incorrect. It might have been supposed that the note on each sheet was sufficient to indicate that the map was of the nature of an advance edition, and that a new edition, completed up to date, would be issued later on. It seems possible that the note, similar to that issued by the agent, which did not state that it was a reduction from the old 1-inch map, and over which the Department had no control, led people to think that it was a new map based on the recent survey.

Q. 1417, 1420, 1445. These errors were due to very small elongations of engraved lines, which have been corrected.

Q. 1425. The drawing of the 4-mile map has been tested in several places, and excepting a few errors of engraving, which should have been detected, it is an accurate reduction of the old 1-inch map.

Q. 1426. It is intended to say that the 4-mile map of Scotland is part of the 4-mile map as ordered for the United Kingdom. The 4-mile map of Scotland will be engraved. The map issued is an advance edition published by photolithography.

Q. 1440-43. The statement that the 4-mile map would have been published even if the Societies had not asked for it is incorrect; as is also the statement that the map would have been published in its present form and title. No money has been asked, as all necessary conditions and facilities due to the new survey can be carried out on the paper plates.

Q. 1444. The statement that the 10-mile map issued with sheet lines is the 10-mile map of the kingdom ordered to be carried out is incorrect. It was decided about four years ago that the 10-mile map was not to be brought out until the material from the Cassinial Survey was available. The papers containing this and other decisions can be produced if necessary.

Q. 1450. The whole question here is whether the high or low-water line should be shown on index maps. It is not the case that the index is incorrect if the line of low-water mark is adopted as the outline of the land area. The difference between the lines of high and low-water, in such places as Morecambe Bay and the estuary of the Severn must manifestly be very great.

Q. 1465 and 1468. As far as is known the 4-mile index is correct—it is certainly not all wrong. The parish of Eccles is an ancient or "mother" parish, and as the index is headed "Index showing civil parishes" the "ancient" parish of Eccles does not appear. There is no civil parish of Eccles.

Q. 1507. The name Hoglowe Pike was inserted on the old 4-inch map on three authorities; and two authorities, one of them the estate agent, have approved the orthography for the 2½-inch map. The farm Uglow was only obtained for a farm.

Q. 1508. The name "Bongs" was authorised by the owner of the farm, and was therefore correctly inserted on the plans.

Q. 1509. The Director-General is not altogether a free agent as regards the annual report. If he were to propose the publication of a Blue Book giving a general summary of European cartography each year, there would probably be considerable objection on the ground of expense.

Q. 1508. The altitude of Caern Alif is shown on the 5-inch and 6-inch scales, but not on the 1-inch map, where it should not be clearly shown. Bonnet, Bon, Van does not appear on the 1-inch map. It is not a hill summit,

and the highest point near is shown with its altitude. It can, however, be added on future editions of the 1-inch map.

Q. 1918. Two complaints only from Mr. Wyld can be traced, they both referred to the quality of the paper used for the 6-inch maps.

Q. 2261. This name appears as "Mapping Bow" on the 1-inch scale map of Cheshire, and applies to a portion of a public road where there is a slight ascent. Three local authorities give the name in this form. It appears as "Mapping Bow" on the old 1-inch map, and it is not given at all on the new series 1-inch map.

Q. 2262. The name "the Howlers" appears on the 1-inch scale map of Cheshire, and applies to a strip of wood. Three local authorities give the name in this form. The wood is called "Alder wood" on the old 1-inch map, but has no name on the new series 1-inch map.

Q. 2368. All town maps, except Bingley, on the recognised large scale can be obtained uncoloured. There are one or two towns on the 1-inch scale, printed in colour several years ago, that can not be obtained uncoloured.

Q. 2373-6. In eight towns that were engraved many years ago, the central sheets that were thickly covered with houses were engraved, whilst the sheets containing the outskirts of the towns were zincographed and coloured. Cambridge is the only town published by zincography in which some of the sheets have been published with the houses hatched and others not. The town was to have been published with the houses hatched, but after some of the sheets of the north end of the town had been published, it was pointed out that the United sheets in which the colleges were hatched looked very poor, and that the Cambridge sheets would look much better if the colleges were coloured and not hatched. As the plans that had been published with the houses hatched were confined to the north end of the town, and did not contain closely built areas, it was not considered necessary to cancel them. It was, however, ordered that future editions were to be published without hatching.

Q. 2391. There is no agency at Southampton drawing stock direct from the Department. There was such an agency, but Mr. Stanford withdrew it some time ago.

Q. 2400-2405. There are frequent complaints of the difficulty of obtaining maps under the present system, chiefly arising from the insufficient stock kept by the agent. The demands of single copies of sheets, amounting to several hundreds a month, show that the agent does not keep a proper stock.

Q. 2406-2426. The statements with regard to the sale of the 6-inch quarter sheets without contours are not quite correct. When it was decided to bring out the second edition with contours at once, a large stock of the first edition remained on hand, and the question arose whether this stock should be destroyed or sold to the very large percentage of purchasers who do not understand the meaning of contours or care whether they are on the map or not. It was decided to sell the uncoloured edition, and, to make a marked distinction between these copies and the coloured copies, to prevent any errors of issue by the agent, and also to encourage the sale, the price was reduced from 1s. to 6d. a sheet. Mr. Stanford objected that the reduction in price would reduce his profits, and be an infringement of his contract; that the cost of taking the uncoloured maps out of his drawers and stamping the new price would be considerable; and that it would not be desirable to sell the two editions of the sheets at different prices. It was held that under the contract the Government had a right to alter the prices of the maps, and arrangements were made under which a minimum of cost and inconvenience would be caused to Mr. Stanford. The cost of stamping the new prices is borne by the Government.

These maps are in no sense "damaged goods." They are the same maps without the contours which Mr. Stanford says the majority of people do not care about (Q. 2406, 2407).

Q. 2612-17. Mr. Stanford having been sole agent for two years, and knowing the "goods he had to get rid of" contracted to pay 600*l.* a year for the sole right of selling them for 10 years.

Q. 2647-54. Complaint is made of the number of sheets in the first Manchester index to the 1-inch survey. The index was published in sections, so as to expedite its publication and allow purchasers to see the sheets that were issued. It is necessary that an index to such large scale maps should be accurate, otherwise purchasers would be constantly ordering the wrong sheets; and an accurate index cannot be made until the plans have been completed. On the one hand the Department is blamed for publishing inaccurate index maps, and on the other hand for not publishing them before it can do so with accuracy (see Q. 2658).

Sir C. Wilson.
Witness.
Manchester.

S. C. Wilson,
Written
Memoranda.

every 15 years, they might be carried out at somewhat reduced rates.

The system I would propose to apply to each town when brought up to date (five-year limit) is briefly:—

- (1.) To revise the M.S. plans once every 15 years at the public cost, the town paying for the publication of those revised plans of which it wishes copies.
- (2.) The department would utilise the revision of the town plans in bringing out a revised edition of the $\frac{1}{2500}$ plans of the towns, but would publish no $\frac{1}{2500}$ revised plans at the public cost.
- (3.) To give each town the option of having any of its plans revised and new editions published, or of having plans added to its existing survey every year on prepayment, under arrangements such as those described above.
- (4.) Borough surveyors to be placed under obligation to notify to the Ordnance Survey Department once a year all changes that have taken place during the previous 12 months.
- (5.) A tariff of prices for additional $\frac{1}{2500}$ surveys, and, if possible, for revisions to be drawn up, and also for publication.

REVISION OF $\frac{1}{2500}$ AND $\frac{1}{5000}$ PLANS AT THE PUBLIC COST.

One of the greatest difficulties that will be encountered in bringing the survey up to the 15-year limit in 10 years' time will be the publication of new editions of such a large number of plans. The publication could not be carried out by the Ordnance Survey Department without an addition to its plant and buildings, and it is worthy of consideration whether some portion of the publication should not be given out to contract. There seems no objection to this, if good results at fair prices can be obtained.

MEMORANDUM ON THE 1-INCH MAP AND ON VARIOUS PROCESSES USED IN THE REPRODUCTION OF MAPS.

ENGLAND is the only country except Italy that publishes its standard map in two forms (in outline and with hills), and as this peculiarity has had a certain influence on the production of the 1-inch map, it may be well to explain its origin.

The old 1-inch map was published in one form only, like the French and other continental maps. On the 22nd June 1846, Colonel Colby proposed that a similar 1-inch map should be published from the 6-inch map of Ireland; and in the same year a Select Committee of the House of Commons on the Irish Survey recommended that a map on a scale of 1-inch to a mile, similar to that of Great Britain, should be made as well as the 6-inch. (Report ordered to be printed 20th August 1846.) The Master-General of the Ordnance, the Treasury, the Lord Lieutenant of Ireland, and the Chief Secretary were, however, of opinion that the 6-inch map was sufficient, and that the preparation of a map on any smaller scale should be left to private enterprise.

On the 21st June 1850, Sir H. de la Beche pointed out that it was most important for geological and general purposes that there should be a general map of Ireland on the 1-inch scale, and with a view of lessening the cost of engraving he suggested that the map should only show what was on the 6-inch map, that is, that it should be engraved in outline only. This proposal was referred to the Director of the Survey who reported, "I have no doubt whatever that the preparation of an outline map of Ireland on the scale of 1 inch to a mile will be most advantageous to the proper execution of the Geological Survey, and be very desirable for many public purposes also."

On the 28th January 1852, the Director of the Survey was instructed to commence a 1-inch map in outline at once; and, to expedite its production, it was engraved in "Quarter sheets."

On the 18th August 1855, a perfect 1-inch map of Ireland with the hill-features was ordered to be commenced. The outline sheets having proved to be of great value to the Geological Survey Department and for general purposes, it was decided to continue their publication, and to produce a distinct map with the hill-features. The system adopted was to engrave

the outline on a copper-plate, and from this to obtain a duplicate plate by the electrotype process. When this had been done the hills were engraved over the outline on the original plate. It was thus possible to produce two editions of the same map, one with hills from the original plate and one without from the duplicate, at a very trifling cost.

This method of producing the 1-inch map was adopted in England when the engraving of the sheets of the northern counties (numbered 1 to 73 in the new series 1-inch map) was commenced; and it was afterwards adopted for the Scotch map.

The adoption of the Irish system completely changed the character of the 1-inch map of England. The survey of Ireland was made for civil purposes, and the production of the 1-inch map of that country was undertaken to meet the civil requirements of the State. The result was that much information was given that was only required for administrative purposes, and that no special attention was paid to details of military importance. The old 1-inch map of England was surveyed on the 1-inch, and 2-inch scales as a military map; nothing was introduced that could not be easily shown on that scale; features of military importance were exaggerated, and details not of military importance were omitted. The adoption of the Irish system, and reduction from a large to a small scale, led to the insertion of names and detail that should not have been shown on a map on the 1-inch scale; that were not required by the general public; and that to a certain extent lessened the value of the map for military purposes. The military character of the map was, in fact, made to give way to the real or presumed civil requirements of the State.

A comparison of Sheets 69 and 98 of the new series with Sheet 81 N.W. of the old series, will show the change that took place when the Irish system was introduced.

In 1870 the Ordnance Survey was transferred from the War Office to the Office of Works, on the ground that the military map of England and Wales on a scale of 1 inch to a mile had been completed. On the 26th May 1871, however, the War Office wrote to the Office of Works that "as the present 1-inch map of the south of England, which was published many years ago, is not sufficiently accurate for military purposes, Mr. Secretary Cardwell considers it desirable that as the cadastral survey of that portion of the kingdom progresses a new 1-inch map with hill-features should be engraved or photozincographed."

In July 1872, after some correspondence, the Treasury approved of the following proposals, made by Sir Henry James, then Director of the Survey, to meet the requirements of the War Department:—

- (1.) That a new 1-inch map in outline with contours and altitudes, reduced from the cadastral survey, be engraved immediately after the plans on the larger scale are produced.
- (2.) That electrotype duplicate plates be produced, and copies therefrom printed for sale.
- (3.) That the hill-features be then engraved on the original outline plate, and published as soon as the sheets of a county, or considerable tract of country, can be struck off.
- (4.) That the outline sheets might at any time, if it were thought advisable, be completed by printing on them hill-features by a cheaper process.

Number 4 was intended to cover any demands from the War Department for the insertion of the hill-features of certain districts by photozincography, without the delay which engraving them would entail.

The sheets of the new 1-inch map of the south of England were constructed on the same meridian as those of the northern counties, so that there might be eventually a complete map of England on one projection. They were also published in two forms which for convenience are treated separately.

1. Outline Edition.

It is a matter for regret that when this map was commenced, at the request of the War Department, more attention was not paid to military requirements. Unfortunately the map was engraved in the same style as that of the northern counties, and though sheets were from time to time submitted to the War Department prior to publication, its general character remained unchanged. From time to time such changes have been made as could be carried out without completely destroying the uniformity of the map; but there are others which might be introduced with

advantage when the map is revised. The nature of the changes that have been made will be seen by comparing No. 285, the first sheet published, in 1874, with sheets 286, 302, 222, 252, 251, 265, published in 1878, 1882, 1887, 1890, 1891, 1892.

The slow progress in the publication of the outline sheets has been due to several causes. Until 1882 the progress of the cadastral survey, from which the map is reduced, was slow, and owing to the preference given to the survey of mineral and other districts there were few surveyed areas sufficiently large for publication on the 1-inch scale. Pressure had been put upon the Department to complete the 1-inch map of Scotland, and most of the engravers were employed on that work. It must be remembered, too, that the demand for the completion of the large-scale maps by 1890 was very pressing, whilst no demand had been made for the completion of the new 1-inch map by any specified date. This naturally led the Directors of the Survey to hesitate to increase the amount expended out of the Vote on the engraving of the 1-inch map.

Early in 1887, however, arrangements were made for expediting the publication; and with a view of securing greater uniformity in the classification of the roads, and of remedying the defects due to mechanical reduction from the 25-inch to the 1-inch scale, instructions were issued for the examination of the 1-inch reductions on the ground prior to publication. The annexed table (A.) shows the result of the arrangements made in 1887 as compared with the progress in previous years.

Under existing arrangements the whole of the new 1-inch map in outline as authorised by the Treasury, including South Lancashire and South Yorkshire, will be completed by the end of 1896. An index showing the programme has been laid before the Committee, but it is proposed to modify this by keeping back the Welsh sheets for a revision of the names, and bringing forward other sheets in their place. It is intended to publish a revised programme (Diagram J.) with the annual report for this year.

The question of still further expediting the publication of the engraved sheets has been considered; and the conclusion arrived at is that, in the present stage of the work, little could be done in this direction without injuring the character of the map. It is believed, however, that the date named will be anticipated.

The revision of the 1-inch map in outline, which is much needed, and for which I have submitted a scheme to the Committee, affords a favourable opportunity for improving the character of the map. Unlike the standard maps of foreign countries, in which military requirements alone are consulted, the British map has to meet both civil and military requirements. How far these can be combined is matter for consideration. The three principal points upon which decisions are needed are, the omission or retention of parish boundaries; the system upon which the roads should be classified; and the insertion of additional contours, whether instrumental or interpolated. The insertion of additional contours will be a work of some time, and should be commenced in the eastern and south-eastern counties, where the ground either lies low or is of military importance.

2. The Hill Edition.

As stated above, the Treasury, when sanctioning the re-engraving of the hills on the new 1-inch map, authorised the insertion of the hill-features of certain districts by photozincography, on the demand of the War Department. Several sheets in the south-east of England were prepared in this manner, the hills being drawn from the field-sketches for the old 1-inch map: see Sheets 273, 285, and 330, and for comparison the engraved sheets.

It was found during the progress of this work that the hill-features taken from the old field-sketches were not, from various causes, accurate enough for insertion on the new 1-inch map. It therefore became necessary to re-sketch the hill-features on the ground, partly on the 6-inch and partly on smaller scales.

The hill-sketchers and engravers were employed on the Scotch map for a considerable period after 1872, the year when the new 1-inch map for the south of England was authorised. It was not until 1874 that the services of any hill-sketchers were available to commence the re-sketching of the hill-features of the south of England, and even then they could only sketch those districts that had been contoured.

In 1872 the question of publishing the 1-inch hill-map by a cheap reproductive process was carefully considered, and it was decided that the map should be engraved, and the cheaper process used only in those cases in which rapid production was required by the War Department. Since that date the cheaper and more rapid processes have been largely adopted on the Continent for the production of Government maps, and the question of substituting one or other of them for engraving in the English 1-inch map has more than once been considered. Visits have been made to Government and private map-producing establishments on the Continent for the purpose of examining the different processes. The establishment at Southampton has been since then visited by officers from the chief Government establishments of Europe, and every opportunity has been taken of keeping up information on the subject. The general feeling has been found to be that none of the rapid processes approach that of engraving in accuracy and beauty, and that their adoption has been in nearly every case a question of economy of time and money. The conclusion has always been that the permanent hill map of England ought to be completed like the maps of Scotland and Ireland by engraving.

Early in 1887 the backward state of the 1-inch hill map was a matter of serious consideration, and steps were taken to gradually increase the progress of the hill-sketching. Under present arrangements the sketching of the hills will be completed in 1898, but this date will be anticipated if it is found that the old hill-sketches of North Wales and the midland counties can be utilised. The accompanying diagram (II.) shows the present state of the hill-sketching.

I also considered (1) the substitution of a more rapid process of publication for that of engraving; and (2) the most convenient mode of publishing an advance edition of the hill map, without interfering with the steady progress of the engraving, should a demand for such an edition arise.

(1.) The question of adopting one of the cheap and rapid reproductive processes for the new 1-inch hill map was, as before stated, carefully considered in 1872, and the decision was in favour of engraving. The reversal of that decision would have led to a break in style in South Lancashire and South Yorkshire worse than that which exists at present, or to the substitution of an inferior for a superior style of representing the hill features in the northern counties. It would have necessitated the superannuation at a great cost of the highly-trained staff of hill engravers. It would also have led to the abandonment of a map which, regarded either as a work of art, or as a pictorial representation of ground, is inferior to none of its class in Europe. If the British 1-inch hill map be compared with the standard hill maps of Austria (1/75,000), France (1/80,000), Germany (1/100,000), and Italy (1/100,000), it will be seen that the general level of the British map is equal, if not superior, to that of any of them, and that some of the British sheets have not been surpassed. The only hill map which is superior to the British is Dufour's map of Switzerland (1/100,000), a country in which the features are strongly marked and lend themselves to artistic treatment. No demand for the early completion of the new 1-inch map either in outline or with hills had been made by the public; and the returns of sales of the beautifully engraved hill sheets of the Scotch Lowlands seemed to indicate that the completion of the outline edition was more urgent than that of the hill edition.

After considering all the circumstances of the case I came to the conclusion that the engraving of the hill map ought not to be superseded by any of the more rapid or cheaper processes; and I am still of opinion that, in the present state of the map, the abandonment of line engraving would be a very grave mistake.

On coming to the above conclusion steps were taken, as soon as the pressure due to the engagement to complete the cadastral survey by the 31st March 1890 allowed, to gradually increase the number of brush draughtsmen and hill-engravers in their proper proportion. By the end of this year, four of the men who have been in training as hill-engravers will be ready to work for progress, and next year four or five more will be ready. This number will be increased if more young men can be found with the artistic talent and technical skill requisite to make a good hill-engraver. The attached diagram (III.) shows the state of the hill-sketching, brush-drawing, and engraving; and Table B. shows the progress of the hill-engraving since 1st January 1872.

Sir C. Wilson.
Written
Memoranda.

Sir C. Wilson.
Written
Memoranda.

(2.) Several experiments were made to ascertain the best way of bringing out an advance edition without disturbing the arrangements for producing the engraved hill-map, and some of the specimens are forwarded herewith.

Two modes of showing hills on an advance edition were considered (A.), by a tint, or as it is sometimes called, "stumping"; (B.) by vertical hachures.

(A.) *By a Tint.*

The following processes for reproducing the brush drawings prepared for the use of the engravers were considered.

(a.) The production of a tint by throwing fine graphite down on a matrix with the air-brush, and then taking an electrolyte duplicate. This gave effective results, but it was found impossible to preserve a gradation of shade that was in perfect harmony with the contours.

(b.) By chalk. To obtain good results with chalk, superior artists must be employed. Its adoption would have necessitated either the withdrawal of the draughtsmen engaged on the preparation of the brush drawings, or the employment of a special staff of artists for six or seven years. The 1-inch map of Palestine is a fair example of chalk work (sheet herewith).

(c.) The reproduction of an air-brush drawing on an impression of the outline by photo-etching. This was tried by Colonel Waterhouse, the head of the Photographic and Publication Department of the Indian Survey, who is well known as one of the leading practical photographers of the day. The results were not satisfactory owing to the great difficulty in etching half-tone with lines together. It was impossible to get clean sharp lines and at the same time to preserve the soft gradation of the hill-shading (specimens herewith).

(d.) The reproduction of the brush-drawings by heliogravure or photo-etching. The brush-drawings are not suitable for reproduction by a photographic process. They are made on outline impressions in black for the guidance of the engravers, and the colour used is not a good one for photography. It would have been necessary to prepare special drawings, and to employ upon them the draughtsmen working for the engravers; and even then satisfactory reproduction of the half-tones would have been doubtful.

(e.) The reproduction of the brush drawings by a process brought to great perfection by Herr Petters of Hildburghausen. This process is cheap and rapid, and Herr Petters was requested to reproduce the hills of Sheet 286, which had been published by engraving (see specimen and engraved sheet). The result, though artistic, is not quite satisfactory. The gradation of shade from lightest to darkest does not present a sufficient range, and the contours are not sufficiently numerous to guide the eye; there is a muddy look about the darker shades, and the smaller features are wanting in definition. It is easier to read the gentler slopes as shown by vertical hachures. On the other hand, the smallest names are clearly read. In the course of correspondence Herr Petters offered either to reproduce the hill drawings by contract, or to give instruction in the process on payment. He also stated that only talented men, accustomed to hill work, could learn the process.

The adoption of this process would have led to the production of a portion of the map in a style quite different to that of the sheets already published or in course of publication, and it would have been necessary either to stop the hill-engraving, and employ the engravers on the work, or to give it out to contract.

(B.) *By vertical Hachures.*

This mode involves the preparation of special drawings in which the features of the ground are represented by vertical hachures and their reproduction by heliogravure, photo-etching, or photozincography. There is no very great difference between the results obtained by either process if the MS. drawing be good. Photozincography is the cheapest and most rapid, and is well understood at Southampton. Heliogravure and photo-etching have slight advantages, such as the production of a metal plate from which impressions can be printed direct; but they are slower and more expensive than photozincography, and their adoption would necessitate special instruction and the introduction of a certain amount of new plant.

The question was not that of producing a new and uniform map of England, but of rapidly publishing a

map of certain districts, which should take the place of the engraved map until it was published. After carefully considering the processes named above, I came to the conclusion that the best mode of producing an advance edition would be by photozincography. Accordingly when, in 1891, the question of an advance edition was raised, I recommended that it should be produced by photozincography at a cost of 6,000*l.*, and should be completed by 1900. This was approved by the Treasury.

The superior hill draughtsmen could not be employed in the preparation of the MS. drawings without seriously interfering with the progress of the brush-drawings for the engravers; but some of the best plan draughtsmen were selected for training. In Austria, two years were devoted to training the draughtsmen before a sheet was published by heliogravure, and the earlier sheets were not very satisfactory. In England the steady publication of the photozincograph sheets will commence early next year. One sheet was issued this year, but it must not be regarded as a specimen of what the draughtsmen will do when they have had more training.

Sheet 271 is a good example of vertical, and Sheets 272 and 290 of horizontal hachuring reproduced by photozincography, and these may be compared with some of the Austrian sheets produced by heliogravure. Sheet 286 has been produced by photozincography, Petter's process, and engraving, so that the three methods may be compared. Specimens of the work now being done by the draughtsmen are forwarded herewith.

It may perhaps be well to state some of the advantages and disadvantages of the different methods and processes, with special reference to the British 1-inch map.

1. *Engraving.*—In engraving, the lines have a firmness and sharpness which cannot be produced on paper with a pen, and therefore no map produced by heliogravure, photo-etching, or photozincography can be so perfect as an engraving. Whilst preserving truthfulness in detail, engraving admits of high artistic treatment in the delineation of ground; it has greater power and greater delicacy than any other process. It is, however, slow and costly, and this has led to the adoption of cheaper and more rapid though inferior processes on the Continent for all new maps excepting those on small scales.

The object aimed at in the 1-inch hill maps of England, Scotland, and Ireland, has been to produce a map of each country which, if the sheets were mounted together, would give an accurate, though conventional, representation of the topographical and geographical features. No rigid scale of shade is used, but the draughtsmen and engravers endeavour to give each part of the country its peculiar character, without losing sight of the general principle on which the map of the whole country is drawn. The general physical appearance of the country can be readily pictured from the map, but it is not possible to ascertain the absolute slope of any particular portion of the ground. The results thus far have been successful, and no map stands so well the test of mounting a large number of sheets together. The varying elevations of the hills, the general orographic relations of the various parts, and the distinctive peculiarities of the different districts, are shown in a way which no other method admits.

2. *Heliogravure or Photo-electrotypy* has made the rapid production of modern maps possible, and it is gradually taking the place of engraving on the Continent. Its merit is that it produces a copper-plate from which impressions can be printed more cheaply and more rapidly than engraving. Its chief defect is that it is a facsimile of a MS. drawing, and that no draughtsman can obtain the same results with pen and ink on paper that an engraver can on copper. There is no great range of shade; it is difficult to make a distinction between ground on different levels; and the hill-features, especially when rocky, are wanting in character. The MS. drawings for the Austrian map could scarcely be surpassed, yet, if the published sheets are placed beside characteristic English or Swiss sheets, their defects are at once apparent. I have never heard of anyone who preferred heliogravure to engraving, but it is regarded as a good substitute.

If a new map of Great Britain were contemplated, considerations of cost and time would doubtless lead to the adoption of heliogravure, photo-etching, or photo-type. At present, however, Scotland and Ireland are nearly completed, a large portion of England has been published, and a trained staff of hill engravers is ready to carry it on. To complete the map by the

inferior process of heliogravure would be a distinctly retrograde movement.

The success of heliogravure depends in great measure on the skill of the draughtsmen, and also on the perfection to which the process has been brought. The Austrian War Department is the only one that has been completely successful; the German War Department has never obtained the same success.

3. *Mezzotint, or photo-reproduction of brush drawings*, in combination with contours, is much in favour with some cartographers. Its advantages are that it combines the accuracy of contours with a pictorial representation of the ground. A perfect map of this kind requires that the contours should be numerous and true, and that the gradation of shade should be in accordance with the contours. On the English map the contours are far too few in number for such a map, and a tint would be no compensation for their absence.

The defect of all tinting is that it is impossible to obtain a sufficient gradation of shade. Tints will give a good general idea of very bold ranges, but in the smaller features, such as so often occur in England, the effect is confusing unless a large amount of light and shade is introduced. In cases where the ground is low, and consists of small broken features, it is almost impossible without hachures to trace the features. Copper-plates for printing tints are always delicate, and even when steeled are liable to injury. A pure plate in black and white can be transferred to zinc and stone and printed quickly on an emergency, or can be photozincographed for producing special maps on different scales, but half-tone hills do not readily admit of such applications.

This method has long been in use in this country for military sketches, in which the contours are sketched by eye, and the tint put on by "stumping." In reproducing such sketches the "stumping" is reproduced by an etching process. The best specimen of this class of work is the French military map of Algeria (1 50,000) in which the contours are conventionally sketched, and a tint in the same colour given by stippling or etching. A strong light is introduced from the left-hand corner to add to the pictorial effect.

4. *Double printing from copper or from transfers to zinc*. The desirability of combining pictorial effect with contours led me to make a change in the mode of engraving the hills. It was formerly the practice to engrave the hills over the outline. This system had

the manifold advantage that only one printing was required; but it had the great disadvantage that every time the outline was corrected the hill work suffered, and had to be repaired at much cost, and to the deterioration of the engraving as a work of art. All corrections also had to be carried out on two sets of plates—the outline and the hill-plates. Under the present system the hill-plates when once completed will never be touched, and will always retain their artistic beauty. The hills can be printed in any colour over the contours, and corrections have only to be made on one series of plates. At the same time a mode of dealing with sheets already published was devised.

Sheet 270 of England is a specimen of the new system, and Sheet 22 of Ireland of the mode in which it is proposed to deal with published sheets.

Some erroneous impressions appear to be entertained with reference to the action of Foreign Governments in regard to maps. In Austria, France, Germany, and Italy, the standard maps corresponding to the British 1-inch are published in black and white, and the ground is shown upon them by vertical hachures. The only difference is in the mode of production. For obvious reasons the standard maps must be in black and white; it is the only way of securing a proper degree of accuracy, and of producing a map of general utility. There has been a great development of coloured maps for special purposes, on scales larger and smaller than the standard maps. These have been produced by various departments, and very largely by private firms, the standard maps being used as the basis. The form of these maps has been almost as varied as their number. In England private enterprise has until the last few years done little or nothing, though no obstacle has ever been raised to the utilisation of the 1-inch in the preparation of special maps. This seems to indicate that there has been no general demand for such maps.

It may be added, with reference to the various modes of representing ground, that the German War Department, which has used sketched contours on its large-scale maps, has in its most recent maps on the 1/50,000 scale adopted vertical hachures, which are printed in brown over a black outline. The Italian maps published by photogravure and photozincography show ground by contours only, and are good examples of this method.

C. W. WILSON,

Colonel.

15th October 1892.

TABLE A.

RETURN showing the NUMBER of SQUARE MILES published of the ONE-INCH MAP in outline from 1872 to 1891.

	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
England -	—	237	216	—	1,363	648	1,245	580	1,088	713	714	432	133	—	452	5,534	951	4,377	5,827	5,258*
Scotland -	532	1,826	433	432	3,187	958	432	—	1,447	1,948	1,386	—	608	2,117	1,045	119	—	—	—	—
Total	532	1,826	649	432	4,550	1,606	1,677	580	2,535	2,661	2,100	432	741	2,117	1,477	5,653	951	4,377	5,827	5,252
	1872-75.				1877-81.				1882-85.				1887-91.							
Totals on 5-year periods.	7,730.				9,029.				6,967.				22,160.							

* Also 390 square miles of the advance edition.

TABLE B.

RETURN showing the NUMBER of SQUARE MILES published of the ONE-INCH MAP with HILLS from 1872 to 1891.

	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	
England	-	-	-	-	-	-	216	-	-	-	-	-	-	-	52	411	500	-	216	216	
Scotland	-	1,167	432	864	1,556	958	-	716	864	678	1,372	-	1,197	1,020	545	1,310	616	1,243	986	717	1,138
Total	-	1,167	432	864	1,556	958	-	932	864	678	1,372	-	1,197	1,020	545	1,362	1,027	1,812	986	933	1,354
	1872-76.					1877-81.					1882-86.					1887-91.					
Totals in 5-year periods.	4,977.					5,840.					4,124.					6,112.					

C. W. WILSON, Colonel.

MEMORANDUM ON CONTOURS BY THE DIRECTOR-GENERAL ORDNANCE SURVEY.

A "contour line" represents the intersection of a horizontal plane with the surface of a hill. "Instrumental contour lines" are laid out on the ground and surveyed, and are true within a permissible error of $\frac{1}{16}$ th of a foot on closing a line from 25 to 38 miles long. "Interpolated contour lines," as shown on Ordnance Survey plans, are run with a water-level but not surveyed; they have a possible closing error of from 1 to 4 feet in a line from 30 to 35 miles long; but the error of the contour shown on the map is probably never so great as one foot. The cost of running instrumental contour lines is about 17s. a mile lineal; that of interpolated contour lines is not known, but is estimated at about 6s. a mile lineal, if an ordinary water-level be used.

In accentuated ground, such as much of that in the six northern counties, the errors in the interpolated contours are scarcely appreciable on a 6-inch plan; but in ground such as is found in the eastern counties and elsewhere, an error of 9 or 10 inches throws a contour line a mile or more out of position. Generally speaking it may be said that where the ground is steep no inconvenience arises from the inaccuracy of interpolated contours, but that where the ground has a gentle slope, interpolated contours are apt to be misleading. The closer levelling for the 25-inch plans of Lancashire and Yorkshire has brought to light several errors in the interpolated contours on the gentler slopes.

In this country the practice in regard to contours has varied greatly. Until the Committee of 1854 reported, instrumental and interpolated contours were inserted on the 6-inch map. Since that date only instrumental contours have been shown. In Ireland all contouring was stopped by Treasury Order dated 3rd July 1857, but it has been resumed by Treasury Order dated 20th August 1890.

Diagram A. and Table I. show the state of the contouring in England; Diagram B. and Table II., in Scotland; and Diagram C. and Table III., in Ireland.

The districts which most need additional instrumental contour-lines are those under 400 feet in altitude, and especially those under 100 feet. It is suggested that instrumental contours might be run at 25, 75, 150, 250, and 350 feet.

It is estimated that the cost of the 25 and 75-foot contours in England and Wales would be about 38,000l. and of the 150, 250, and 350-foot contours about 122,000l., and that the cost of the same contours in the cultivated districts of Scotland would be about 32,000l., or a total of 192,000l. for Great Britain. The cost of interpolating contours with a water-level, like those in Lancashire and Yorkshire, at 25, 75, 150, 250, and 350 feet, over England, Wales, and the cultivated districts of Scotland, would be about 65,000l.

Contours at 25-foot intervals were recently interpolated on two 6-inch sheets, with sufficient accuracy for military purposes, by two staff officers, for the War

Department. The officers interpolated the contours, classified the roads, and supplied all the information requisite for a military map in a satisfactory and rapid manner. It is calculated that work of this kind would cost about 30s. per square mile. Thus, to interpolate contours at 25-foot intervals to the highest altitude, with sufficient accuracy for military purposes, and at the same time collect all the information necessary for a good military map, would cost about 75,000l. for England.

It is suggested that the following scheme might be carried out, the expenditure being spread over ten years:—

	Estimated Cost.
Instrumental contours to be run at 25 and 75 feet	38,000
Instrumental contours to be run at 150, 250, and 350 feet	122,000
Instrumental contours to be run at 1,500 feet	6,000
Instrumental contours to be run at 25, 75, 150, 250, and 350 feet in cultivated districts of Scotland	32,000
	198,000
Additional contours at 25-foot intervals to the highest altitude, to be sketched with sufficient accuracy for military purposes, in England and Wales and in the cultivated districts of Scotland	75,000
	£273,000

An index map of England, showing approximately the areas under 100 feet, between 100 and 1,000 feet, between 1,000 and 2,000 feet, and over 2,000 feet, is attached.

The areas not fully contoured are approximately:—

	Square Miles.
Under 100 feet	9,131
Between 100 and 1,000 feet	37,425
Between 1,000 and 2,000 feet	3,412
Above 2,000 feet	116
	50,084
Add Lancashire and Yorkshire, already fully contoured	7,831
Area of England	57,915

The contouring of Ireland will follow *pari passu* the completion of the 25-inch sheets and their reduction to the 6-inch scale. Very little has yet been done. It is estimated that the cost of contouring Ireland according to the present system will be about 120,000l., and that the cost of running additional contours at 25, 75, 150, 250, and 350 feet would be about 30,000l.

The following estimates are submitted:—

ESTIMATE.

Sir C. Wilson,
Written
Memoranda.

---	Instrumental.	Interpolated with Water- Level.	Part Instrumental, Part Interpolated with Water-Level.	REMARKS.
ENGLAND AND WALES.				
Contours at 25 feet and 75 feet - -	£ 38,000	£ 13,000	£ —	It would not be safe to inter- polate these contours with a water-level in the flat districts of the Eastern Counties. * $\frac{2}{3}$ instrumental and $\frac{1}{3}$ inter- polated. † $\frac{1}{2}$ instrumental and $\frac{1}{2}$ inter- polated.
Contours at 150, 250, and 350 feet - -	122,000	40,600	96,500*	
Contours at 450, 550, 650, 750, 850, 950 feet	100,000	34,000	67,000†	
Contours at 250 feet intervals above 1,000 feet	—	15,000	—	
SCOTLAND, CULTIVATED DISTRICTS ONLY.				
Contours at 25 feet and 75 feet - -	8,000	2,700	—	* $\frac{2}{3}$ instrumental, $\frac{1}{3}$ interpolated. † $\frac{1}{2}$ instrumental and $\frac{1}{2}$ inter- polated.
Contours at 150, 250, and 350 feet - -	24,000	8,000	18,700*	
Contours at 450 950 feet - -	50,000	17,000	28,000†	
Contours at 250 feet intervals above 1,000 feet	—	5,000	—	
IRELAND, CULTIVATED DISTRICTS ONLY.				
Contours at 25 feet and 75 feet - -	6,000	—	—	
Contours at 150, 250, and 350 feet - -	15,000	5,000	11,700	
Contours at 450, 550, 650, 750, 850, and 950 feet.	9,000	3,500	—	
Contours at 250 feet intervals above 1,000 -	—	3,500	—	

N.B.—It is not possible to give a close estimate of the proportion that instrumental contours would bear to water-level contours on the supposition that the latter would be substituted for instrumental contours on steep ground. The proportions given in the column of remarks are only approximate.

OPINIONS OF CIVIL ENGINEERS ON CONTOURING.

LETTER from Sir J. FOWLER.

Braemore, by Garve,
Ross-shire, N.B.
August 16, 1892.

SIR, In reply to your letter of the 2nd instant, I would venture to express the following opinion:—

In the counties where on the 6-inch map contours are given at 50 feet instrumentally fixed, and at 25 feet interpolated (such as Yorkshire), the system is found to be very convenient, and sufficient for many practical purposes, viz.:—

(1st.) In laying down the approximate course of new railways.

(2nd.) In fixing upon sources of water supply for towns and villages.

(3rd.) In designing and carrying out drainage works.

The two last-named purposes have become of late years very numerous from the requirements of the Local Government Board, and other central and local authorities.

On the whole, I recommend the Yorkshire system to be adhered to, in all counties of like character.

In the Highlands of Scotland such an elaborate system would of course be a waste of money.

Yours, &c.

(Signed) JOHN FOWLER.

Major Johnston, R.E.

LETTER from EDWARD WOODS, Esq.

6, Victoria Street, Westminster,
London, S.W.,

August 9, 1892.

SIR, I BEG to acknowledge the receipt of your communication of the 2nd instant, relative to the question of the sufficiency of the contours as shown on the plans of the Ordnance Survey, and I have much pleasure in giving the committee my opinion on the matter.

I have had frequent occasion in the course of my practice to avail myself of the contoured plans. These I have found very serviceable in facilitating surveys of country, and determining, and setting out, the approximate course of railways, roads, and other public works. I have found the contour lines representing the 50 feet vertical intervals to be sufficient for this purpose. Although intermediate contour lines may, in

certain exceptional cases, be found serviceable, they would not, if provided, supersede the necessity of having accurate levels taken over the entire course of any projected line of works.

The numerous levels and bench-marks shown on the Ordnance Survey plans are readily discoverable on the ground, and the contour lines taken in conjunction with these afford, in my opinion, information adequate to render it unnecessary and undesirable to incur the heavy cost of contouring and interpolating additional ones.

I consider that the conclusions arrived at by the influential Committee of 1854, and adopted by the Ordnance Survey Department, meet the reasonable requirements of the case.

I beg to remain, &c.

(Signed) EDWARD WOODS.

Major Duncan A. Johnston, R.E.,
Departmental Committee
on the Ordnance Survey,
3, St. James's Square, S.W.

EXTRACTS from LETTER of Sir C. GREGORY,
K.C.M.G., &c.

2, Delahay Street, Westminster, S.W.,

SIR, August 10, 1892.

* * * * *

(3.) The increase of these contours to 25 feet or even to 50 feet intervals would no doubt be of advantage to engineering operations of various sorts, more especially for the purpose of water supply and drainage, and to a lesser extent for railways and roads and canals, but additional contour lines at closer vertical intervals unless traced with accuracy might be rather misleading than useful.

(4.) I assume that if such additional contours were carried out they would be co-extensive with the Ordnance Survey, while their value for civil engineering purposes would be limited to particular districts. If this be the case, I am of opinion that the value to local interests would not be sufficient to call for the large expense which would have to be borne by the public.

I have, &c.

(Signed) CHARLES HUTTON GREGORY.

Major D. A. Johnston, R.E.,
Secretary to the Committee on
Ordnance Survey.

Civil
Engineers on
Contouring.

Civil
Engineers on
Contouring

LETTER from W. SHELFOED, Esq.,

35A, Great George Street,
Westminster, S.W.,

SIR,

August 5, 1892.

In reply to your inquiry under date the 2nd instant, I beg to say that the conditions of the country, and the applications of the Ordnance Survey have necessarily altered greatly since 1854, and this should be taken into consideration in reading the Report of the Committee of that year, weighty though it certainly was.

I venture to think that you can ascertain, and you should at first take means to do so, who are the principal purchasers of Ordnance maps.

As a civil engineer I have no hesitation in saying:—

(1.) That the more information given, the better for our purpose.

(2.) That the contours should not be at equal distances in all parts of the country, but should vary according to the inclination of the surface.

It is obvious, for example, that the contours in a flat country should be very much nearer, measured vertically, than in a steep country.

(3.) The distance between contour lines should rather be determined by horizontal uniform measurement than by vertical, and it would not be difficult to classify the various districts in such a way as to give approximately uniform horizontal distances between the contours, whilst the vertical distances might vary according to some classification to be determined upon for each class of country.

(4.) In flat countries the contours will be useless unless they are accurately determined by instruments, but in steeper countries contours interpolated with the water level will suffice.

(5.) Where the coal measures occur, and coal has been or is likely to be mined, I am decidedly of opinion that the contours should be omitted altogether as the subsidence of the country in such cases already renders the Ordnance bench-marks and levels useless.

I have, &c.

(Signed) W. SHELFOED,
Mem. Council Inst. C.E.

Major D. A. Johnston, R.E.,
Secy. Committee on Ordnance Survey,
3, St. James's Square, S.W.

LETTER from HARRISON HATTER, Esq., C.E.

ORDNANCE SURVEY.

33, Great George Street, Westminster, S.W.,
August 12, 1892.

SIR,

REPLYING to yours of the 30th ult., I have always found the Ordnance maps answer every purpose for which a map can be used, and I am not of opinion that additional contours are necessarily required, that is to say, I do not think that their value would justify any material increased outlay. I think, however, a useful addition might be to write on summit levels above the last contour, presuming as I do that this would not involve much expense.

I have, &c.

(Signed) HARRISON HATTER.

Major D. A. Johnston, R.E.,
Departmental Committee on the
Ordnance Survey,
St. James's Square, S.W.

LETTER from A. GILES, Esq., C.E.

26, Great George Street, Westminster, S.W.,
September 7, 1892.

SIR,

In answer to your Circular of the 2nd August respecting the sufficiency of contour lines on the plans of the Ordnance Survey, I beg to say that I am of opinion that if contour lines are to be at all useful, they should be laid down with great accuracy and not interpolated.

I am further of opinion that as so many bench-marks have been established throughout the country, it will not be necessary to increase generally the number of contours, but I would suggest that contours would be very valuable (particularly for drainage purposes) beginning at 25 feet above datum level, and continuing at 25 feet apart up to (say) 250 feet above datum level, after which I think contours at 50 feet apart would be sufficient up to 1,000 feet above datum, and I doubt very much whether contours will be of much practical use above that level.

I have, &c.

(Signed) ALFRED GILES.

Major D. A. Johnston, R.E.,
Secretary,
Departmental Committee on the
Ordnance Survey.

EXTRACTS of LETTER from Sir ROBERT RAWLINSON,
K.C.B.

"Contour lines cannot alone be relied upon for practical purposes. The bench-marks are reliable, and it is from these that practical men must and do work. The inch map (formerly 98 N.E., now sheet 39), having Kendal on it, and fully contoured, is a beautiful specimen of contouring and engraving, but to follow this up for the entire survey of the United Kingdom would be a waste of power and of money."

LETTER from Sir GUILFORD MOLESWORTH, K.C.I.E.

Chambers Nos. 29-31,
17, Victoria Street, Westminster, S.W.,
August 8, 1892.

SIR,

In reply to your letter of the 2nd instant, requesting my opinion respecting the contouring of the Ordnance maps, I have the honour to remark that the system of levels and contouring adopted on the Ordnance maps has been most valuable.

I concur with the recommendations of the Committee of 1854, and bearing in mind all the conditions of the case, as stated by you, I am of opinion that additional contours beyond those of 50 feet apart vertically are not required as a rule; but if it should be decided to add contour lines at intermediate heights, I am of opinion that such contours should be instrumentally traced with accuracy.

I have, &c.

(Signed) GUILFORD L. MOLESWORTH.

To the Secretary of the Committee
on the Ordnance Survey.

LETTER from J. MANSEGH, Esq.

Westminster Chambers,
5, Victoria Street, Westminster, S.W.,
September 6, 1892.

SIR,

In answer to your inquiry dated the 2nd August "as to whether additional contours are required (upon the 6-inch Ordnance maps), and if so at what vertical intervals," I have the honour to state my opinion based upon an experience of the use of such maps extending over 30 years.

Of course I speak as an engineer and not as one of the general public, and perhaps the best way will be to mention two cases of the same sort, one of which occurred in the year 1868 and the other last year, that is, 1891. The first was a scheme for a new water supply for Sheffield, of which I prepared the parliamentary plans. We there had 6-inch Ordnance maps with contours 25 feet apart. By means of these I laid down a line of aqueducts about 20 miles in length falling with a regular gradient throughout, marking it carefully upon the plans. The sheets were then handed to the surveyors who were instructed to set out a line on the given gradient, with the invert of the conduit a certain number of feet below the ground and to take a section over it. When this line came to be laid down on the plans it coincided almost exactly throughout with the tentative line marked upon the plans from the contours.

As a contrast with this I was working last year on a line of conduit from the River Elan in Radnorshire to Birmingham, about 80 miles in length, where throughout the Ordnance maps are contoured only 100 feet apart.

It would be too much to say that these maps were useless so far as levels are concerned, but I am not

exaggerating when I say that if we had had maps similar to those available in 1868 in Yorkshire the time and cost of locating the conduit would not have been a third of what it was.

Between two contours 100 feet apart you may have differences of 99 feet either up or down, and but for the levels upon roads it would be impracticable to make any use of the contours for such a purpose as I am referring to.

Then when we came to determine the sites of storage reservoirs on the streams among the hills the 100 feet contours were of no use. First of all they go only up to 1,000, and we had to work 300 feet higher. For this work we had to set out and survey independent contours 25 feet apart in order to get approximate contents with sufficient accuracy.

To myself personally as an engineer it mattered little what plans were available. As the necessary information was not provided at public expense on the Ordnance maps I had to procure it.

To my clients the Corporation of Birmingham it meant some thousands of pounds. It is not for me to say whether they should have been saved this outlay at the expense of the nation.

This is a typical case. I have had to do with many similar in kind but of minor importance, and no doubt the trouble, such as it is, prevails all over the country where sanitary works are under consideration and 100-foot contour maps are alone procurable.

In my opinion, whatever contours are printed upon the maps should be reliable within a foot or two.

I have, &c.

(Signed) JAS. MANSEERGH.

Major Duncan A. Johnston, R.E.

Victoria Mansions, 28, Victoria Street,
Westminster, S.W.,

September 5, 1892.

SIR,

I HAVE carefully considered your communication of the 2nd August.

Contours, if accurately traced, are of great importance to engineers.

Up to a height of, say, 500 feet, they should not be more than 25 feet (vertical) apart, beyond that up to 1,000 feet I should consider 50 feet vertical sufficient, and beyond 1,000 feet 100 feet vertical.

Interpolated contours are not to my mind of much value.

Levels on fixed surfaces are of great importance in addition.

I have, &c.

(Signed) DOUGLAS FOX.

Major Duncan A. Johnston,

Secretary,

Departmental Committee,

Ordnance Survey,

St. James's Square, London, S.W.

Civil
Engineers on
Contouring.

APPENDIX.

Appendix I.

APPENDIX I.

RESOLUTIONS of INSTITUTIONS of MINING ENGINEERS.

Chesterfield and Midland Counties
Institution of Engineers,
13, Cavendish Street, Chesterfield,
June 27, 1892.

SIR,

I BEG to inform you that at the annual general meeting of this institution, held on Saturday last, 25th June instant, in University College, Nottingham, Mr. Henry Lewis, of Annesley Colliery, President, in the chair, the following resolution was unanimously passed, and I was thereupon instructed to forward it to the Secretary of the Ordnance Committee now sitting to inquire into the subject of plans, &c. :—

Resolved—“That, whilst fully appreciating the good work done by the Ordnance Survey and the general utility of the plans, this meeting of mining engineers regrets that the scale upon which they are published renders them of little practical value for the purpose of working plans of mines; and further, this meeting suggests to the Ordnance Survey Department that if the plans of mining districts were published in sheets on a scale of two chains to one inch with the buildings simply lined in and the trees omitted, such plans would be of practical use for the working plans of coal mines and of general service for mining purposes.”

I have, &c.

(Signed) W. F. HOWARD,
Secretary.

Major D. A. Johnston,
Ordnance Survey,
3, St. James' Square, London, S.W.

Federated Institution of Mining Engineers,
Newcastle-upon-Tyne,
September 15, 1892.

DEAR SIR,

I ANNEX copy of a resolution passed at the annual general meeting of this institution, held at Stoke-upon-Trent on September 7th and 8th, which you might kindly convey to the Departmental Committee of the Ordnance Survey.

I have, &c.

(Signed) GEORGE LEWIS, President.

Major D. A. Johnston, R.E., Secretary,
Departmental Committee on the Ordnance Survey.

Resolution.

That whilst fully appreciating the good work done by the Ordnance Survey and the general utility of the plans, this meeting of the Federated Institution of Mining Engineers regrets that the scales upon which they are published renders them of little practical value for the purpose of working plans of mines, and further, this meeting suggests to the Ordnance Survey Department that if the plans of mining districts were published on a scale of two chains to an inch with the buildings lined and the trees omitted, such plans would be of practical use for the working plans of coal mines, and of general service for mining purposes; further, that the Ordnance Department should make it generally known that tracings from the plotted plans may be obtained from the Chief Office, Southampton, and also that the price for such tracings may be at a reasonable cost per sheet.

Appendix II.

APPENDIX II.

WRITTEN EVIDENCE of Sir J. BALL-GREENE, late, and Mr. J. G. BARTON, M.I.C.E., present,
Commissioner of Valuation and Boundary Surveyor of Ireland.

QUESTIONS by Committee.

(1.) “State in what manner the Irish maps of the Ordnance Survey are used for valuation purposes.”

(2.) “It is understood that the Irish maps of the Ordnance Survey have a legal status which those in England have not. Will you kindly explain to what extent this obtains and how it arose?”

(3.) Are the maps satisfactory as regards style of execution, form, and information conveyed

- (a) for valuation purposes;
- (b) for general purposes?

(4.) Is the price of the Ordnance map unreasonable?

(5.) How are the enclosures numbered on the plans for valuation purposes, and how are the areas of enclosures obtained?

REPLIES (Valuation Department).

(1.) The scales most in use in this Department are the 6-inch plans for rural and the 60-inch plans for urban surveys. The tenements are marked and indexed with red lines and numbers on both of these scales.

Urban tenements consist for the most part of houses and gardens.

Rural tenements of houses and land.

The reference number on each tenement corresponds with the index number in the lists, which set forth the details of area and valuation.

(2.) A legal status for valuation purposes is given to the Ordnance maps by Act 15 & 16 Vict. c. 63, s. 35, which provides that they be accepted as determining the contents upon which the valuations are based.

(3.) In the counties which have been revised the maps are faultless in detail and characteristic.

In the unrevised counties they are far from being up to date in either respect.

(a) For valuation purposes the 6-inch plan is very satisfactory for rural work, except in suburban and in what are called “congested districts,” where the 25-inch plan is preferable.

For towns and cities the 60-inch plan is found to be the most useful scale.

(b.) For many general purposes, such as land transfers, land improvement, or rotation cropping, the 6-inch and the 25-inch plans now in progress are the most suitable.

(4.) The price of the sheets, which has been reduced by one half within the past 25 years, is generally regarded as moderate.

(5.) The enclosure of least area dealt with in this Department is the tenement or farm. The boundaries of these are not indicated by any engraved characteristic on the Ordnance map. Nor would it be desirable to define them.

The method of defining and numbering for the purposes of this Department is dealt with in Answer No. 1.

The areas are obtained by computation. The computed areas being assimilated by per-centage to the engraved area of the townland.

(6.) Have you found the maps accurate ?

(6.) The accuracy of the revised maps is universally acknowledged. They have been subjected to such a variety of tests, and from so many quarters, that an undetected error can hardly exist.

It may be added that the Valuation Office has had very few appeals against the computed areas.

(7.) Do they give sufficient information ?

(7.) In the revised counties the information afforded is ample.

(8.) Are the maps kept sufficiently up to date ?

(8.) The revised counties are well up to date. There does not seem to have been any attempt made to keep up the 6-inch plans in the unrevised counties except by showing in them new lines of railway.

(9.) Are the maps generally appreciated in Ireland by the public ?

(9.) The maps are so very generally appreciated that almost all private surveys are now either enlarged from them or practically based upon them.

(10.) Are the maps uniform in style, &c. ?

(10.) Subject to the question of the contrast between the revised and the unrevised maps they are very uniform.

(11.) Are the roads correctly shown and classified ?

(11.) The roads so far as this Department has occasion to consider them seem to be well classified. It is not a question, however, with which this Department is conversant.

(12.) Do you consider that the maps show sufficient contours and levels ?

(12.) Three or four counties only have been contoured. The contours are very useful to land improvers and railway engineers, but are of little use to this Department.

I wish to express the opinion that a contour survey would be desirable in all counties not yet contoured.

(13.) Are the names correct, especially the Celtic names ?

(13.) So far as could be learned from the Celtic scholars who have at one time or another served in the Department, the Celtic names are admirably rendered.

Consistent with phonetic necessity they retain, as far as possible, the shape of the word which seems best to embody the descriptive element in the name.

This Department has had in the progress of the Boundary Survey occasional opportunities of perceiving with what care the alternative spellings were considered by eminent Celtic scholars before the name now in use was finally adopted by the Ordnance Department.

(14.) Do you think it would be feasible to require by legislation local authorities to notify to the Ordnance Survey all alterations in roads, streets, houses, &c., so as to assist the Ordnance Survey in revision ?

(14.) It might be expedient to require of local authorities a notification of changes occurring in their districts.

As, however, there is no change in road or street or house which does not involve a change in valuation, all such changes necessarily come to the knowledge of the Valuation Department during the progress of the annual revision; it is also suggested that no legislation would be necessary in order to require this Department either to submit its plans for inspection, or to furnish to the Ordnance Office an annual list of such changes as have occurred.

(15.) At what intervals do you consider the maps should be revised (a) for towns; (b) for agricultural districts ?

(15a.) The convenient intervals for revision would vary from 5 years in a thriving port to 20 years in an unprogressive inland town.

(15b.) For agricultural districts intervals of from 20 to 30 years.

And for pastoral districts it is difficult to foresee at what distant period a revised map may become necessary, the features are so little liable to change.

(16.) Is the paper on which the maps is printed satisfactory ?

(16.) The paper is tough in fibre and of excellent quality; its tendency, however, to shrink in drying constitutes a serious defect, a tendency all the more embarrassing by reason of its want of uniformity even in copies taken from the same plate.

(17.) Please point out any defects you have found in the Ordnance Survey maps as now published, and say if you have any suggestions to make for improving them.

(17.) Subject to the views contained in the foregoing answers, no improvements seem to suggest themselves except—

The abandoning of any scale greater than 60 inches to a mile. For valuation purposes so many 10 ft. plans would be required for a single day's inspection as to make at times an unmanageable load. City and town ship engineers in Ireland seem unanimous in their preference for the 60-inch plans.

The introduction of a reference number as well as the area on each enclosure on the 25-inch scale would be of no use for valuation purposes, but would on the contrary be a source of confusion in this Department.

It has been suggested, and the suggestion is given for what it is worth, that they might be found to be of descriptive use in land transfers, or to farmers for rotation cropping.

Should it be decided to show reference numbers, it is recommended, so far as regards the Irish Survey—the townland being the unit of legal subdivision—that the enclosures should be numbered by townlands and not by parishes or plans as suggested in your letter.

July 1892.

APPENDIX III.

FOUR-MILE MAP OF ENGLAND.

EXTRACT from the "TIMES," Friday, April 15, 1892, and the REPORT thereon of the DIRECTOR GENERAL of the ORDNANCE SURVEY.

Parliament and the Ordnance Survey.

To the Editor of the "Times."

SIR,

THE Ordnance Survey has just produced a new map of England on the scale of a quarter of an inch to the mile, or $\frac{1}{400000}$. The map is in 15 sheets, 30 in. by 22 in., and the price of each sheet is 2s. It is published at an opportune moment, at the time when inquiry into the Survey is being pressed for, and doubtless is intended by the authorities to show what the Department can do by way of giving a general summary of the results of its operations in a map of manageable proportions. Critics have from time to time complained that many of the Ordnance Survey productions are obsolete at the time of publication. Confident in the accuracy of its methods and the beauty of its processes, which we are told are the admiration of the civilised world, the Department is serenely indifferent to such criticism. It is stated on the margin of the sheets that the new map is reduced from the old series 1 in. maps; that is to say, four fifths of the country is represented as it was from 60 to 100 years ago. Indubitably it affords valuable information from an educational point of view, imparting to the rising generation an idea of the progress and development which must have taken place since the days of its great-grandparents.

In the early decades of the century the rate of development was slow in comparison with later times. It being impossible for the Ordnance Survey to portray the entire face of the country as it was in any particular year it is well that the period selected should be one during which no great change took place in its features. In the language of photography an exposure of 40 or 50 years is required by our national cartographers to obtain a picture of the face of the country. It is, therefore, incumbent upon them to perform the operation at a time of minimum motion. On the whole, from this point of view, the map may be pronounced a success, though it is open to the suspicion of having been touched up in places. In the neighbourhood of Birmingham, for example, it shows features which could hardly have existed in 1820, and there are other anachronistic blemishes which might, with a little care, have been avoided.

It was a clever idea, and one which emphasizes the lesson which the map is obviously designed to teach, to insert the railways constructed up to December 1890. The great seat of chemical industry, Widnes, a town of 40,000 inhabitants, is not shown, but five lines of railway converging upon the site will at once arouse the attention of the duller student of commercial geography. The recent growth of popular pleasure resorts is also apparent. Blackpool, although two railway lines run to it, is shown as rather less in size than the neighbouring hamlet of Cleveleys, and the name is given in the smallest characters, whilst the village of Bispham, close by, is accorded the dignity of larger type. The village of Formby is bigger than Southport, and, at least, 12 times the size of Blackpool. St. Ann's and Morecambe do not exist even in name, although a railway station and pier are given to the latter. Buxton is no bigger than Rowsley and considerably less than Castleton in the Peak. All down the Welsh coast and generally throughout the kingdom the black rectangular patches denoting railway stations are marked without names being attached. By using Bradshaw's Railway Guide map as a key the new Ordnance map affords a convenient means of testing one's knowledge of localities.

In the preparation of a reduced map the selection of the names and artificial detail that are to appear upon the smaller scale is always a matter of difficulty. "To meet this difficulty prints from the reduced photographs are now examined on the ground by highly-trained men, who eliminate unimportant detail and add important features that have been accidentally omitted during the process of reduction." If it were not for the knowledge of these precautions one might have objected to particular "ironworks" and "glassworks" in the neighbourhood

of Dudley, Tipton, and Oldbury—a very crowded district—being singled out for mention on a map of such small scale to the exclusion of place names.

The Ordnance Survey still refuses to be led away by what it considers the meretricious methods of colour-printing so freely adopted abroad, and adheres to the severe simplicity of black on white. Knowledge which is easily acquired is apt to be not lasting, a disadvantage which is likely to follow the use of the easily interpreted foreign maps. No such danger need be apprehended in the case of the new map, for it appeals to the highly educated map reader who wishes to train himself in the appreciation of the subtlest and most minute distinctions of character. If such a one can discriminate between the roads, rivers, and canals, say in the district between Wellington and Ironbridge or about Wolverhampton and Birmingham, he is a past-master in the art, and the result of his labours will be an indelible impression of the detail on his memory. As a somewhat easier exercise, the tracing out of the watershed line between the Trent and Severn basins may be recommended, whilst the beginner will find it a sufficiently hard task to follow the course of the Severn, say from Shrewsbury to Worcester.

In the manner of indicating roads, the time-honoured custom of the Ordnance Survey has been adhered to, namely, that no matter what the scale of the map may be, or whatever the class of road, it shall invariably be delineated by two parallel lines. This method, in combination with monochrome printing, renders it exceedingly difficult without gross exaggeration to differentiate the various kinds of roads. The skilful use of shadow lines in the new map, however, makes it possible to distinguish the great main roads from the rest. The Department must be congratulated on this feat in cartography.

At the risk of being thought hypercritical, it may be suggested that under the limitations which are necessarily imposed by adherence to the methods named it would, perhaps, be as well not to show any routes or tracks not practicable for vehicular traffic. In the new map, many footpaths such as those from Wastdalehead over the Styhead Pass to Borrowdale, from Langdale over the Stake Pass, from Grasmere by Grisedale Tarn to Patterdale, and the track known as High Street, which reaches an elevation of over 2,500 ft., are shown in exactly the same manner as the coach road through the Kirkstone Pass. Those who do not possess considerable local topographical knowledge might easily be misled. I am aware that in raising this objection, I am rather ignoring the principle upon which the Ordnance Survey has always been conducted. It does not construct maps for popular use. "The Department is directed to make maps on certain scales for State purposes." This map may be designed, say, for the War Office as a general route map, the requirements for which may differ from those of the general public. On continental maps as many as five different classes of roads are indicated, but then these maps are not so mathematically accurate as ours, and are made for a people which expects Government assistance and Government interference at every turn, a state of things so contrary to the spirit of the age in England.

The author of that entertaining book "Flatland," describes how in that country it was considered heresy to speak of a third dimension. So far as concerns maps, the British public is almost as orthodox as the circular priesthood and polygonal nobility of Flatland. It is true that at one time even the Ordnance Survey was permeated with three-dimensional heresy. In the old series 1-in. maps an attempt was made to render the third dimension pictorially by what was called hill shading. The heresy would appear to be rapidly dying out amongst the officials of the Survey, for there is little on the new map to offend the susceptibilities of the most orthodox of bi-dimensionalists. It is only on the two northern sheets that a few heights are given; the remainder of the map is absolutely free from any reference to the forbidden thing.

Criticism of the river system of Flatland geographers by one who is of "the rebel race which refuses to be confined to a limited dimensionality," may appear somewhat invidious, but by the open confession of heretical opinions I leave the orthodox free to discount the value of my judgment on this part of the work. I will confine my observations to a part of the country which I know

intimately—viz., South Lancashire. The Borsden Brook is shown to rise near Hindley at a point which is about 200ft. above sea level, and flowing for four miles or so up hill, crosses the watershed line of the Mersey and Douglas basins near Blackrod at an elevation of about 430 ft., finally discharging into the Leeds and Liverpool Canal. The Middle Brook is also shown as crossing the same watershed line. In this case the evidence of others who have penetrated the wild wastes between Bolton and Horwich can be adduced to prove that this stream belongs to the Mersey and Irwell basin, and not to that of the Douglas. After getting into the wrong river basin it meets at Addlington a brook of about equal size; flowing up the valley from Wigan the two combining form an anonymous stream which runs westward for four miles, rising in that distance some 250 ft. to cross a minor watershed near Writhington, then, turning southward, the waters rush violently down a steep place and are lost in the canal. Lest at any time, owing to the steepness of the ascent, the flow should be too great, the map provides half way between Addlington and Writhington a means of escape for the surplus by a branch crossing over Coppull Moor and joining the Yarrow at Croston. The main stream of the Yarrow is shown to originate in the canal south of Chorley. The upper Yarrow has, like an eminent statesman, three courses open to it. It may go south by Horwich to join the Middle Brook, and with it take one of the two courses already indicated, or, bending north and westward, may empty itself into the canal at Duxbury Park. The turning point at Rivington, where the choice was exercised, has for 40 years been buried beneath the Liverpool waterworks. It is much to be regretted, therefore, that there should be any doubt of the accuracy of the map in depicting this interesting hydraulic phenomenon.

In the early days of the Ordnance Survey many complaints were made of blunders in the spelling of place names, also that occasionally wrong names were attached to certain features or localities. Now we are told that every care is taken by consulting learned philologists and local topographers to insure correctness. We must assume, therefore, that there is good authority for continuing to call the tableland of the Kinder Scout by the ridiculously inappropriate name of the Peak, notwithstanding that certain wicked local antiquarians insist that it was a blunder of the early surveyors, who, finding themselves in the "Peak" district, looked about for a mountain to which they might attach the name.

The inhabitants of the suburb of Liverpool known as Wavertree will, perhaps, be surprised to find that the correct spelling of the name of the district is Weavertree, whilst Holcombe has been corrected to Helcombe, and the river Medlock is henceforth to be known as the Medleek.

The price of this remarkable work, considering the excellent quality of the paper, cannot, except with regard to sheets 1 and 3, be considered excessive. Sheet 1 contains nothing save the title, and sheet 3 is absolutely blank. What the cost of the work has been to the nation there is no ready means of ascertaining; but it will give the Select Committee of Inquiry, which the House of Commons has recently agreed to appoint, an example of the latest methods and processes of the Ordnance Survey. Whether they are or are not such as to inspire confidence, that the quarter of a million of money which is voted for the Ordnance Survey every year is being expended to the greatest advantage there can be no manner of doubt.

Your obedient servant,

HENRY T. CROOK.

9, Albert Square, Manchester.

ORDNANCE SURVEY.

THE 1-INCH TO A MILE MAP OF ENGLAND AND WALES.

Mr. Crook's Criticism in the "Times" of 15th April 1892.

DIRECTOR-GENERAL,

In accordance with your instructions, I have inquired into the complaints brought forward by Mr. Crook, C.E., in a letter which appeared in the "Times" of the 15th instant, with reference to the 1-inch to a mile map of England and Wales.

Much of what Mr. Crook says is perfectly true, but is entirely inapplicable to the map in question. He misses the objects for which the map has been produced; his remedies would make the map worse than it is now; while its principal defect is not mentioned by him at all, and the actual errors he has discovered in the map are of the most trivial kind.

You are aware that the copper plates of this map, as reduced from the old series of the 1-inch map, remained for a long time in this office, for various reasons, in an incomplete state. Latterly some demand has arisen for maps on this scale for different special purposes. The Geological Survey desired to use it. Mr. Stanford put forward demands for transfers from it for the preparation of archaeological maps, and it has been occasionally wanted for the special representation of large areas such as Parliamentary or Local Government Board districts. For all such objects a general map of the country on this scale is desirable.

Three courses were open for adoption as to its preparation:—

1. To wait for an entirely new 1-inch map based on the new series, and 1-inch map now in progress. Against this course was the conclusive reason that it would put off the completion of the map to an entirely indefinite time.
2. To bring the existing map up to date in all respects. Against this was the almost equally conclusive reason that it would materially delay the production of the engraved new series 1-inch map, now proceeding under great pressure.
3. To revise and complete the existing 1-inch map in so far as to enable it to be utilised for such general purposes (geology, archaeology, &c.) as those above mentioned. As to this course the known defects of the map were two: it is out of date in some respects, and some of the sheets are over-crowded with detail. But neither of these defects materially interferes with the utility of the map for those special purposes. It shows towns, villages, main roads, rivers, and county boundaries with sufficient accuracy and completeness, while railways could be easily transferred to it from the 1-inch map without an examination on the ground. It is true that it shows a number of minor roads, some disused and many useless, but although they encumber the map and obscure other details, they do not interfere with the special representation of such areas as the Parliamentary or civil divisions of the country. It was therefore decided to adopt this third course, but the precaution was taken of entering a note on each copy of the map that it is, and pretends to be nothing but a reduction of the old 1-inch map with the railways added. The public cannot therefore complain of any deception in the matter.

It remains to take up in detail Mr. Crook's complaints. They are, when disengaged from the large quantity of ornamental writing in which they are enveloped, practically as follows:—

1. *Obsolescence of the Map.*—This has been in some respects explained above. But Mr. Crook really brings forward only two precise points of complaint under this head, namely, the size of certain towns as shown on the map, and the omission altogether of the towns of Widnes, Morecambe, and St. Ann's. These latter omissions must, of course, be rectified; but as to the size of the towns on a map of this scale, it is comparatively immaterial for the purposes of the map. No one expects to find an accurate delineation of the streets of a town on a scale of 1-inch to a mile.
2. *Selection of the Names which appear on the Map.*—This is a point on which no two people will ever probably agree, and Mr. Crook's own remarks are inconsistent with each other. Just before complaining that the names of large iron works are inserted he complains that the names of all railway stations, however insignificant they may be, have been omitted.
3. *Non-use of Colour-printing on the Map.*—To adopt Mr. Crook's views on this subject would spoil the map for its special objects. It is likely to be most required for the delineation of particular features or areas. For these the use of colour applied after printing will probably be necessary, e.g., for the technical details of geology or for delineating special local areas. As the map is now printed the colours so added will stand out clear and distinguishable. If in addition Mr. Crook's five classes of roads, besides all rivers and canals, were shown in colour the map would be a confused net-work of various colours, all equally difficult to distinguish.
4. *Roads.*—Mr. Crook treats this map as if it were, or could be made fit for, a good road map. The map on the scale of 1-inch to a mile is the road map of this country. Mr. Crook seems to think that Sheet 5 of this 1-inch to a mile map should be available as a travelling map for the Lake District.

Appendix III.

The sheet contains all Westmoreland, most of Lancashire and Yorkshire, with great part of Cumberland and Durham, of which area the Lake District occupies a very small part in the north-west corner. Most people would get a 1-inch map for the Lake District only.

As to roads, they are no doubt the principal defect in the map, but in a point not noticed by Mr. Crook, namely, that in most districts too many are shown, including some disused and many useless roads, which obscure other more important features.

5. *Hills*.—This would crowd still more an already, in some places, over-crowded map; and they are unnecessary for most of the purposes for which a map on this scale is likely to be required.

6. *River-Courses in Error*.—This, apart from some errors about names of places, is the only really wrong detail which Mr. Crook appears to have discovered on the map. The area in which these wrong water-courses occur is about six miles by four. Being near the sources these streams would probably be more accurately described as ditches than as rivers, and most of them would more properly have been omitted from a small scale map like this. Owing to their sources being within a few hundred yards of each other, and a want of clearness on the old 1-inch map, they have been in some cases run into each other by the draughtsman who made the reduction from the 1-inch map to this scale, and will now, of course, have to be either erased or corrected.

The error was long ago pointed out by Mr. De Rance, of the Geological Survey, but was unfortunately overlooked during the publication of this map. It was alluded to by Mr. Crook in a letter to, I think, the "Manchester Guardian" last year, and his present account merely amplifies and largely adorns his previous remarks on this subject.

7. *Names*.—The name "The Peak" is correctly enough written to denote the position of a well-known district on the map.

The three errors pointed out in the spelling of Lancashire names are engraver's errors.

The net result of Mr. Crook's elaborate criticism appears, therefore, to be that on this map of all England and Wales he has found errors in the delineation of three or four obscure rivulets in one corner of Lancashire, and a few errors in the names of places.

The rest of his letter merely records under several heads the opinions of Mr. Crook on the making of maps. It is in fact clear that this is the main object of the whole letter. Those opinions were already sufficiently well known. They seem to be entirely derived from an attentive study of continental maps, which may or may not be better than English maps. At any rate, however sound the opinions may be in the case of maps on larger scales, they have

mostly little application to a map on the small scale of the one now in question.

(Signed) J. FARQUHARSON,
Lieutenant-Colonel.

29th April 1892.

SECRETARY,

I FORWARD a memorandum by Lieut.-Colonel Farquharson, C.B., on the letter of Mr. Crook to the "Times," which answers the points raised.

The history of the map on a scale of four miles to an inch is as follows:—It was commenced in 1859, the intention being to produce a general map of the kingdom on that scale, from the original map on a scale of one inch to a mile. The southern and midland districts of England were reduced from the old one-inch map, and engraved in outline, and the northern counties were reduced from the large scale maps of those districts.

In 1872, when the new one-inch map was authorised, the engraving of the four-mile map was discontinued, partly because every engraver available was wanted for the new map, and partly because it was intended to delay the publication of the map until it could be thoroughly revised from the Cadastral Survey.

In 1884 the Director of the Geological Survey wrote to ask whether the map could not be completed for use by the Geological Survey, and stated that "even in the parts reduced from the old one-inch Ordnance maps it is sufficiently accurate." In consequence of this letter the engraving of the map was resumed, and, as its completion was for geological purposes, the cost of engraving was charged to the Geological Survey.

It soon became known that we had an unpublished engraved map on a scale of four miles to an inch, and in 1887 Mr. Stanford asked for transfers from the plates to enable him to prepare a map of England on that scale to illustrate a series of papers on archaeology for the Society of Antiquaries. Transfers of several counties were supplied to Mr. Stanford, and as the supply of a complete set would have been to publish the map in fragments, I determined to issue the map for sale with its known imperfections. I was the more induced to do this as the map of Ireland on the same scale has been very largely used for a variety of purposes.

It would have been throwing money away to thoroughly revise a map of this class before the completion of the new one-inch map, and the engravers are all at present employed under pressure in finishing off the one inch. The only features revised up to date are the railways, which, on account of the sections of ground seen in cuttings, are of importance for geological purposes.

To guard the public against the belief that it was a new map a note was added to the effect that the map was reduced from the old survey.

I quite concur in Colonel Farquharson's remarks.

(Signed) C. W. WILSON,
Colonel.

29th April 1892.

Appendix IV.

APPENDIX IV.

FOUR-MILE MAP OF ENGLAND.

Board of Agriculture,
3, St. James's Square, London, S.W.,
July 18, 1892.

SIR,

I AM directed by the Board of Agriculture to forward to you, for the information of the Departmental Committee upon the position of the Ordnance Survey, a copy of a minute by the Director General upon the articles which appeared in the "Times" newspaper on June 4th and 10th, headed "A New Ordnance Map of England."

I am, &c.
(Signed) T. H. ELLIOTT,
Secretary.

Major Duncan A. Johnston, R.E.

The "TIMES," Saturday, June 4, 1892.

A NEW ORDNANCE MAP OF ENGLAND.

I.

The fact appears to be less generally known than it deserves to be that a new outline map of England and

Wales on the scale of four miles to the inch has just been produced and published by the Ordnance Survey. In an annual Blue-book, recently published for the present year, and entitled "Report of the Progress of the Ordnance Survey to the 31st of December 1891," the birth of this new map is modestly recorded in a single line as follows:—"The map of England and Wales on a scale of four miles to an inch has been completed in outline." This retiring modesty is not generally characteristic of the Ordnance Survey. It has, indeed, a very good conceit of itself, and in some respects its conceit is justified—or rather, perhaps, we should say that it has been justified in the past. So far back as the year 1867 a French official report spoke of "l'Ordnance Survey œuvre sans précédent et qui devrait servir de modèle à toutes les nations civilisées." This is high praise, and it comes from the official representatives of a State whose maps are some of the best in the world. A department which once deserved such praise may well be excused if it sometimes blows its own trumpet rather loudly. Nevertheless the publication of the new map has, as we have seen, been recorded with unwonted modesty. The public at large has scarcely so much as heard of the new map, and this, if the map were a good

one, would be a great disadvantage, because maps prepared at the public expense are obviously made for use and circulation, and they cannot be circulated and used, as they ought to be, unless their existence is generally known and their value generally recognised. It shall not be our fault, however, if the public does not now learn quite as much as it is ever likely to want to know about the new map.

Let us briefly inquire how the Ordnance Survey, a department which five and twenty years ago was described as an unprecedented organisation, and was held up on competent and impartial authority as a model to all civilised nations, has acquitted itself in the execution of its latest undertaking. Our readers have already to some extent been enabled to anticipate the results of such an inquiry. In a letter on "Parliament and the Ordnance Survey," which we printed on April 15, Mr. H. T. Crook, C.E., criticised the new map with great severity, and dwelt on its innumerable faults with a vivacity which was at once highly entertaining and perfectly just. Mr. Crook is no mean authority in the matter. He has twice called the attention of the British Association to the shortcomings of the Ordnance Survey, and induced the council of that body to pass resolutions urging various changes and improvements. He has been recognised in the House of Commons as the prime mover in the demand for that reform of the survey which the House has acknowledged to be necessary. He is the author of a pamphlet on "The Maps of the Ordnance Survey, as they are and as they ought to be," which we noticed on April 29, and of this pamphlet we need only say here that it puts the whole case as against the survey as at present conducted with great moderation and yet with irresistible force. As regards the new map now under consideration we find in Mr. Crook's pamphlet the following sentences which put the whole matter in a nutshell:—"For what purpose this map has been constructed it is impossible to say. It is bad in design, bad in execution, entirely obsolete in artificial, and grossly inaccurate with regard to natural detail." In this general condemnation we entirely concur, as well as in the more detailed criticisms contained in Mr. Crook's letter above referred to. But the matter is so serious and the public interests involved are so important that we prefer not to rest our condemnation on independent criticism, however high its authority and however just its conclusions. We will examine the map for ourselves and justify our condemnation of it up to the hilt.

We have to consider, in the first place, not merely what the map is, but what such a map ought to be. We cannot blame the map for being a mere outline map, since it does not pretend to be anything else. But the growing practice of the Survey in publishing so many of its maps in outline is most certainly not one to be commended. It is said, indeed, on behalf of the Department, that the outline form of map seems to be more favoured by the public than the hill-shaded, as the sale is much greater. The reason probably is not that the purchasers of maps do not appreciate hill-shading, but that the shading on many of the maps is so dark that it interferes with and often totally obscures other and more important detail. That this is purely a fault in execution and not one inherent in the use of hill-shading any one can see for himself by glancing at a sheet of the French State map, published by the Ministry of the Interior, about which we shall have something to say hereafter. But with this preliminary protest against the mere lazy and unintelligent preference for outline maps over properly shaded maps, which the Survey, by its own shortcomings, has done so much to encourage, we will take the new map for what it professes to be—namely, an outline map pure and simple. An outline map is at best merely a skeleton, but even a skeleton should be articulate, and its lack of muscle and integument should at least enable its structural relations to be clearly and accurately displayed. Now, a map on a $\frac{1}{4}$ -inch scale is not, indeed, one on which all local details can be exhibited, but, as compared with any maps to be found in an atlas even of the largest size, it is a very large map. Mounted as a wall map, the 15 sheets of this $\frac{1}{4}$ -inch map of England and Wales would be about 10 ft. long by about 7 ft. 6 in. wide. On such a map it is possible to give a great deal of local detail. There is room for all important roads, and for a great many of the more frequented minor roads, and in this case a well-constructed map would show a palpable and unmistakable difference between the two classes of roads. There is room for all important parks and enclosures. The courses of all rivers should be clearly traceable from mouth to source, together with those of their more important tributaries. Towns can be indicated in their main features, and even villages can be shown, not as mere conventional dots, but as organic assemblages of houses. Of railways, canals, and other artificial features

of comparatively modern date it is unnecessary to speak. If a map on such a scale does not show these it is worthless except as an antiquarian document. If it does show them, however, it must show them in due relation to other contemporary features. To take a map of ancient date and cover it with a network of the railways existing at the time of publication is a gross falsification of history and geography and an outrage upon common sense and practical convenience. No private map-maker could afford to publish a map constructed in this bungling and really almost fraudulent fashion. His customers would laugh in his face the moment he showed it to them, and its sale would be *nil*. Yet this is exactly what the Ordnance Survey has done in the production of the new $\frac{1}{4}$ -inch map of England and Wales. We are not disposed to laugh in the face of the Ordnance Survey, however; the matter is far too serious. The cost of the map must have been something considerable; whatever it may have been, every penny of it has, in our judgment, been thrown away. If the officers of the Ordnance Survey had taken the money and flung it into Southampton water they would have made just as good a use of it as in the production of this worthless, inaccurate, and scandalously misleading map. If our readers take our advice and rely upon our judgment they will never buy a single sheet of it, for they will only buy so much good paper spoiled. We are quite aware that these are strong words, but we are prepared to make good every syllable of them.

In the first place, the map bears its own condemnation on the face of it. It was published, as we have said, only a short time ago. Any one buying it, therefore, would have a right to assume that it was substantially up to date. But a note in the corner of each sheet informs us that it is "Reduced from Old Series One-inch Map. Railways inserted to September, 1891." Of course, any one who reads this note and knows enough about the history of the Survey to understand what it means would not need to look any further. He would not trouble himself to examine the map and consider it on its merits, because he would know at once that for practical purposes it was rendered worthless by its method of construction. Probably the officials of the Ordnance Survey really know this as well as any one, perhaps even better. Their own earlier performances show that they know perfectly well what a good map is and how to produce it. Some of their early work is as fine as any that the art and science of map-making have ever produced. If, then, they have produced a map so undeniably bad, and bad without qualification as this $\frac{1}{4}$ -inch map, the real fault would seem to lie not with them, but in some other quarter of the official hierarchy. We shall have a good deal to say about this hereafter. But we cannot by any means exonerate the Ordnance Survey itself. It must take the responsibility of the map it has produced. We will not insult it by supposing that it thinks it a good map or one worthy of its own reputation. We can only suppose that it thinks it good enough to satisfy the Treasury on the one hand, and the British public on the other. That is the most charitable hypothesis we can frame, and it is certainly very little creditable to the self-respect or even to the good sense of the Department.

For what is the "Old Series, One-inch Map" from which this precious $\frac{1}{4}$ -inch map is reduced with the railways inserted to 1891? From the annual report for 1891 of "The Progress of the Ordnance Survey," we find that "the first sheet of the original 1-inch map of England and Wales was published on the 1st January 1801, and the last on the 1st January 1870." This means that no part of the new map is less than 22 years old, while many parts of it are a good deal more than 50 years old. For example, a sheet, purchased the other day, which contains Basingstoke and the surrounding district, has the following note in the corner, "Published August 11, 1817, by Colonel Mudge, Tower. Printed from an Electrototype taken in 1886. Railways inserted to September 1885." We shall not waste time and space in demonstrating that such a map is worthless. The proposition proves itself in the mere statement of the facts. In 70 years the whole face of the country changes. Old roads disappear, new ones are made, commons and open spaces are enclosed, and nearly every town and village is altered by new buildings beyond all recognition. A map more than 70 years old is not to be brought up to date by merely inserting railways as they are constructed. Such being the nature of the 1-inch map from which the new $\frac{1}{4}$ -inch map is reduced, it follows that the latter necessarily has all the radical faults and defects of the former, and unless the reduction is executed with intelligence and adequate local knowledge it is inevitable that the reduced map should exhibit in addition many faults and defects of its own. Anyone who looks at the new map will see at a glance that

Appendix IV.

Appendix IV.

this is so. We select the 12th sheet for examination as likely to be, on the whole, the most familiar to the majority of our readers. It contains London, in a fairly central position, and extends from a little beyond Newport Pagnell, in the north-west, to the North Foreland, in the south-east, and from a little beyond Ipswich, in the north-east, to a little south of Petersfield, in the south-west. It thus includes London and its environs to a *minimum* distance of some 40 and a *maximum* distance of some 80 miles. As the map is an outline map, and does not profess to be anything else, we must not, of course, look for any physical features beyond such as can be represented on the horizontal plane; but it might perhaps be thought that though hills cannot be given their names might be inserted where they are characteristic and distinctive. So, indeed, the compilers of the map seem to have thought, in one case at any rate, for the Gog Magog Hills, near Cambridge, are marked, though no trace is to be found of the well-known Chiltern Hills, which extend across three counties at least. So much for hills. Next, of woods and forests we seem to find some faint and arbitrary traces in certain parts of the map, as though the draughtsman had begun to insert these features in outline and then tried to efface them without success. In no other way can we account for the occurrence here and there of certain faint and irregular lines, generally but not always enclosing a space, which are otherwise meaningless, and in any case are wholly unexplained. Certainly in some cases these lines appear to occur where woods are marked on the larger scale maps of the Survey. Of parks and enclosures indicated on the map the selection appears to be purely arbitrary, and the same may be said of open spaces. Hampstead Heath does not appear, but Batchworth Heath, a little common near Rickmansworth, is marked, apparently because at the time when the original survey was made it already had one or two houses round it.

Chorleywood Common, a well-known golfers' haunt, does not appear, but not far from the place where it should be we have the fascinating name Mumfidgets, and this is really interesting as showing the antiquarian value of this $\frac{1}{2}$ -inch map, since no such place as Mumfidgets appears on the 1-inch map of the new series. It appears, it is true, in the old series, but only as one of a group of several more familiar names, so that its insertion in a map not too well provided with local detail can only be attributed to the taste of the draughtsman in nomenclature. Turning to another part of the map, and finding no such place as Ascot, we certainly need not be surprised that Camberley does not appear, and that Wellington College has no existence. For such omissions some reason, though clearly not a good one, may perhaps be given; but it is manifestly inexcusable that three important roads should be omitted in the single parish of Wokingham, although the map finds space to give us the obsolete alternative of Oakingham for its designation, and that another road should be given which has altogether ceased to exist for more than 30 years. As to the courses of rivers and their tributaries, to trace them on the map is a hopeless task; but perhaps on this point Mr. Crook has already said enough. We will only add that the results of our own examination of a southern district of the map correspond substantially with the results of his examination of a northern district. But the crowning absurdity of the map is to be found in London and its neighbourhood. London ends on the western side of Kensington Gardens. All the rest is apparently open country. There is no Embankment and no Northumberland Avenue, and, unless we are mistaken, even New Oxford Street does not exist. The Metropolitan Railway is there, and the District Railway runs, we suppose, along the foreshore of the Thames. In the east all the railways leading to the Victoria and the Albert Docks are given, but the docks themselves are not to be found. There is no such place as Stratford, though as "Stratford-atte-Bowe" was known to Chaucer it is to be presumed it was still in existence early in the century, when this part of the 1-inch survey old series appears to have been constructed. A network of railways surrounds the site of the Crystal Palace, but the Crystal Palace does not appear, and this is the more remarkable because the Alexandra Palace, a much more recent institution, is marked. It may be that the words "Alexandra Palace" were meant for the name of a railway station, but if so it is one of the few railway stations named on the map, the general practice being, legitimately enough perhaps on a map of so limited scale, to indicate them only by a symbol.

We might go on almost indefinitely to point out the faults, defects, omissions, inaccuracies, anachronisms, blunders, and general slovenly execution of this portentously bad map. But perhaps we have said enough. At any rate, anyone can satisfy himself that we have not said too much by simply taking a sheet of the map containing

a locality with which he happens to be acquainted and examining it in the light of his local knowledge. We can promise him plenty of entertainment, enough, perhaps, to repay him for the 2s. expended on the sheet. But what may be said to him is so much loss to the British taxpayer. With no other object can we imagine anyone spending so much as even 2s. on so absolutely worthless a map. It may perhaps be urged, indeed, we have reason to know that it is the view of the authorities of the survey, that the map ought to be regarded, not, indeed, as a finished production, but as a mere skeleton map upon which any information can be placed, such as boundaries of administrative districts, geological characteristics, and the like. It is even said that the map of Ireland on the same scale has been found to be more useful, and has been made the basis of the numerous special maps which have been prepared during the last few years. We should hesitate to advance this plea ourselves as an apology for the Survey Department, but it is at any rate about the best that can be said for the map, and we must add that the best is hopelessly bad. To add authentic and accurate information to a map which is, as we have shown, inaccurate, unauthentic, and misleading, would simply be to make confusion worse confounded. Administrative boundaries often run along roads, and a map which omits three important roads in a single parish is not one which any competent local authority would be at all likely to trust. Geological characteristics are generally correlative to such physical features as the relation of river valleys to their respective watersheds, and this relation is hopelessly falsified in many cases, as Mr. Crook has conclusively shown. The truth is that the map is thoroughly and hopelessly bad, and nothing can ever make it a good one. The fact is quite indisputable, and the sooner the Survey Department and all other authorities concerned are made to understand and acknowledge it the better. On a future occasion we propose to inquire into the probable causes of this most disastrous and discreditable fiasco.

The "TIMES," Friday, June 10, 1892.

A NEW ORDNANCE MAP OF ENGLAND.*

II.

In a former article we examined at length the character of the new Ordnance map on the scale of four miles to the inch, and showed that it was utterly worthless in itself and altogether unworthy of the high reputation of the Department responsible for its production. We have now to consider how and why it is that the Ordnance Survey—a department whose high reputation in the past is quite indisputable—has incurred the discredit of producing so deplorably inferior a map. In the main we believe that the Department itself is not primarily to blame. It was required to produce an outline map on the $\frac{1}{2}$ -inch scale. To do this some existing map on a larger scale had to be taken as a basis. Now, although the Ordnance Survey is more than a hundred years old, it is nevertheless a fact that the only complete survey of England and Wales is the "Old Series One-Inch Map," the publication of which began, as we have seen, in 1801, and was completed in 1870. The survey is now quite obsolete. But, though the Department has now for many years been engaged on a new survey and on the production of five distinct series of maps on different scales based upon this survey, not one of these series is so far complete as to serve as the basis of a map on the reduced scale of four miles to the inch. Hence for the Survey Department it was simply a case of Hobson's choice. To produce a map on the required scale it had to take the old survey or none. If it had waited until the new 1-inch map was completed the $\frac{1}{2}$ -inch map could not have been published during the present century; and we may add that when it was at last published it would necessarily have been found to be obsolete in many districts of the country. This is an inevitable consequence of the absurdly slow rate at which, even now, the new survey is being prosecuted. We need not go into all the complicated and bewildering intricacies of the new survey, its scales, its methods, and its results. The essential thing for our purpose is its slow rate of progress. Now a cadastral survey, such as the survey of the kingdom on a scale of 1:2,500, or 25:344 in. to the mile, now in course of execution, is necessarily a somewhat tedious affair. It cannot at the same time be hurriedly and thoroughly executed. But the rate of execution in any given district being determined by the time required for

* The former article on this subject appeared on June 4th.

thoroughly complete and efficient work, it is obvious that any number of districts should be simultaneously surveyed at the same rate and in the same time if only the staff employed were large enough and the money necessary to defray the expenses incurred were forthcoming. The first and indispensable requisite is an efficient staff of surveyors and an adequate organisation for the co-ordination of the results obtained by the survey and the publication of the maps based upon these results. If these conditions are not satisfied, no satisfactory survey is possible. But the whole history of the Ordnance Survey and the high repute it has always enjoyed may be taken as a proof that these conditions exist, at least potentially, in the *personnel* of the Department. We have very little doubt that if the Ordnance Survey were empowered and instructed to produce a complete map within such reasonable limits of time as are compatible with the efficient execution of the map, and were given sufficient funds to enable it to make the maps of every scale from 25 in. down to 1 in. or $\frac{1}{2}$ in. as complete in respect of accuracy, precision, and fulness of detail and beauty of execution as any maps now produced in the world, it would show itself equal to the task. But the Ordnance Survey has never been empowered or even enabled to undertake and execute such a task. It has been hampered and impeded at every stage by niggardly estimates and contradictory instructions. We do not say and we do not think that it has always made the best use of its resources, or rendered the results of its labours accessible to the public in the most convenient and business-like manner. On these and cognate points there is not a little to be said, and we trust that they will engage the serious attention of the Departmental Committee which Mr. Chaplin, under whose Department the Ordnance Survey has now been placed, has lately appointed.

But the slow rate at which the survey is now being carried on, and the unsatisfactory character of many of its results, are really very largely due to causes for which the Survey Department cannot itself be held responsible. Rapidity of execution is mainly a question of money, and the money voted for the survey is insufficient to secure the required rapidity. The result is that before any one branch of the survey is completed, or nearly completed, the necessity for revision has arisen. The mere statement of the fact is the condemnation of the whole system. The Ordnance Survey costs on the average something like a quarter of a million a year. We certainly do not think the results produced are anything like a satisfactory equivalent for this large outlay, and here is another very important matter which the Departmental Committee might well be empowered to consider. But that is not the question immediately before us. We presume that the Treasury, which is responsible for recommending the annual vote to Parliament, is satisfied that the Survey Department gives money's worth for the money it obtains. In that case the slow rate at which the survey is being executed and the manifest inadequacy of many of its results are due to want of the necessary funds, and are therefore directly the fault of the Treasury. An increase in the rate of progress and an increase in the efficiency of the results can only be obtained by an increased annual expenditure. Is it not manifest, then, that an increase in the annual vote is imperatively and urgently needed, unless the Ordnance Survey is to become what it is fast becoming—a reproach and a scandal—instead of what it once was—a credit—to the country and a model for the imitation of all civilised nations?

By all means let the Ordnance Survey itself be reformed, if, as is probable enough, the niggardly and unintelligent treatment to which it has been subjected has impaired its efficiency, and lowered its once high standard of attainment. It is for the Treasury to see that the money actually voted for the survey is efficiently and economically expended. But it is for Parliament and the public to consider whether such a survey as the national interests require can be executed on the terms at present imposed on the Department. On this point there is scarcely room for two opinions. So slow is the rate of progress that no single survey is even approximately complete except the old survey, now obsolete, which began with the century. The miserable $\frac{1}{2}$ -inch map is the necessary and inevitable consequence, and another consequence is that, long before the so-called new survey is complete, the necessity for a systematic revision has arisen, and has been recognised by the Treasury. Here we come to the root of the whole matter, and on this point we cannot do better than quote a trenchant passage from a paper read by Mr. Crook at the meeting of the British Association held at Leeds in 1890:

So far as the great cadastral map is concerned, there is no ground for complaint. It fully answers all that is required in a work of that class, and is one of which the Department may feel justly proud. But the very best work

in maps becomes of very little value if not kept up to date. It is quite time that a permanent revision department was instituted on a liberal basis if the great work which has been accomplished is to retain its value. Already large portions of it are disgracefully obsolete, and consequently the smaller scales reproduced from it. The new 1-inch lags so far behind that it is often obsolete before publication. Does any other nation in the world exhibit such a spectacle as a Government cartographical institution engaged in the production of obsolete maps? Again and again has this, the necessity of revision, been pointed out. Every Director-General has pressed the matter on the attention of the Government; it is dwelt on in every annual report. In 1882 the Treasury "recognised the necessity of a revision " of the Survey which should be constantly in progress at " such a rate as would complete the whole in every 15 " years at least;" but it was not until December, 1886, that they decided to commence, adding the following extraordinary memorandum:—"It is to be clearly understood " that in agreeing to the commencement of the revision " they do not bind themselves to any fixed term for its " completion, or to the annual provision of any fixed sum " for carrying it out." This is the sort of thing which is absolutely fatal to the proper conduct of a department like the Ordnance Survey. It is a repetition of the indecision and blundering which have cost the country so much in the past, and to which most of the deficiencies of the Survey are attributable. It would be a good plan, for the information of the map-users, if this Treasury memorandum were printed in red on the margin of every sheet which has not been revised for more than 15 years.

A consideration of the date at which the amazing memorandum quoted by Mr. Crook was issued would seem to show that the parlous state to which the Ordnance Survey has been reduced is directly the consequence of that zeal for economy, laudable enough in itself, but indiscriminating and unintelligent in its application, and very disastrous to the public interests in many of its results, which was displayed by Lord Randolph Churchill during his brief tenure of the Chancellorship of the Exchequer. But the evil done is happily not past remedy, and we are happy to acknowledge that Mr. Chaplin, who, as Minister of Agriculture, is now directly responsible to Parliament for all that concerns the Ordnance Survey, appears to be aware of its magnitude and anxious to abate it. The terms of reference to the Departmental Committee which Mr. Chaplin has lately appointed appear to be wide enough to satisfy all reasonable criticism, and if the Committee is strong enough to overcome the *inertia* of Governments and the chronic obstruction of the Treasury, there is good reason to hope that the Ordnance Survey will once more be placed on a satisfactory footing, and speedily recover its former reputation. The Committee, said Mr. Chaplin on May 9, "has been appointed to inquire into and report on " the present condition of the Ordnance Survey, and " especially to consider (1) what steps shall be taken to " expedite the completion and publication of the new or " revised 1-inch map (with or without hill-shading) of the " British Isles; (2) what permanent arrangements should " be made for the continuous revision and speedy publi- " cation of the maps (1-500 (towns), 25-inch, 6-inch, and " 1-inch scales); (3) whether the maps as at present issued " satisfy the reasonable requirements of the public in " regard to style of execution, form, information conveyed, " and price; and whether any improvement can be made " in the catalogue and indexes. I propose to lay the " report and proceedings of the Committee upon the table " for publication as a Parliamentary paper." We are not quite satisfied, however, that a Departmental Committee is likely to be as efficient and searching an instrument of reform as the Select Committee of the House of Commons originally proposed by Mr. Roby. We pointed out in the case of the Wantage Committee that a Departmental Committee is the recognised official way of shelving an awkward and troublesome question, and if we believed that Mr. Chaplin's Committee had been appointed in this spirit we should be forced to the conclusion that the last state of the Ordnance Survey is only too likely to be worse, if possible, than even its present state. But the publication of the $\frac{1}{2}$ -inch map must surely bring matters to a crisis. It proves to demonstration that there must be something absolutely rotten either in the Survey Department itself or in the Department which controls its expenditure. We think we have shown where the fault really lies, and that it does not lie primarily with the survey itself.

On the other hand, we must add that in our judgment the survey itself would be none the worse for a pretty stiff measure of reform. It cannot produce maps based on a new survey at a greater rate than the funds voted for the new survey will permit. But it might make such maps as it does produce a great deal better than they are. The old

Appendix IV.

survey is now obsolete, and nothing more need be said about it. For many parts of the country it is still all that the Department has to show, but its faults are acknowledged, and no one pretends that it is not in many respects hopelessly and incurably antiquated. Such parts of the new survey as have been published, however, are very far indeed from being as they ought to be. That they also suffer in many instances from the incurable vice of being out of date is due to causes which we have already investigated and traced to an origin outside the Survey Department proper. But, due allowance being made on this point, the maps are still unsatisfactory. They are printed only in a single colour. The different classes of roads, lanes, field tracks, and footpaths are very inadequately indicated. The monochromatic character of the map renders the detail, natural and artificial, very confusing. Where hill-shading is employed, it is generally so dark in places that the letterpress becomes illegible. Where it is not employed the contour lines, which, if sufficiently clear, sufficiently numerous, and sufficiently close together, would give a picture of the physical configuration of the country far more accurate than any hill-shading could furnish, are so faintly marked as to be often indistinguishable, and so far apart that their topographical significance is reduced to a *minimum*. Even if they were printed in red, as has been done by the Department in the case of a few experimental sheets, where the rivers are also printed in blue, this latter defect would remain without a remedy.

The lines are given on the 1-inch map at intervals of 100 feet of vertical height up to 1,000 feet above mean sea-level, of 250 feet between 1,000 feet and 2,000 feet, and of 500 feet above 2,000 feet. This is altogether insufficient in a lowland country where the gradients are for the most part slight, to secure a proper delineation of topographical characteristics, though in mountainous districts, where the gradients are steep, it would probably be found fairly sufficient. In that case, however, the omission of the intermediate lines at the higher levels above 1,000 feet is a grave defect. There is, however, no sort of reason why contour lines and hill-shading should not both be employed, if the resources of colour printing are utilised to their full extent. An experimental sheet has lately been prepared by the Department with the hill-shading printed in light brown, and, though the execution is rather clumsy, the attempt deserves all encouragement. It may be thought, perhaps, that we are asking for too much detail in a map on the comparatively small scale of 1 inch to the mile, and the plea is often advanced by the Department, the contention being that no country is so full of artificial detail as England, and that the attempt to give it all would merely lead to confusion. This sounds plausible enough, but two answers may be made. If the scale is too small, a larger scale might be adopted with advantage. There is no principle in a figure, and probably for many purposes, a 2-inch map would be more convenient than a 1-inch. The question of scale, however, is one which might well be exhaustively discussed by the Departmental Committee; due weight being given to the very important military consideration that a 1-inch scale map is probably the largest that could be carried by officers on active service, as the field of manoeuvres in war necessitates a large area being considered. On the other hand, the advantage of a map on a scale intermediate between the 1-inch and the 6-inch scales now being produced, appears to be demonstrated by the fact that it is found necessary for many military purposes to enlarge the 1-inch map to a scale of two, or even three inches to the mile. But the second answer that may be given to the plea that details are liable to overcrowding in a map on the 1-inch scale, appears to us to be quite decisive. The problem of reconciling the utmost multiplicity of detail with perfect clearness of delineation, has been successfully solved in the case of many of the maps issued by Continental Governments, the most brilliant example known to us being the map issued by the French Ministry of the Interior, to which we have already referred. Of this admirable map, which is, as will be seen, on a scale much less than an inch to a mile, we will borrow Mr. Crook's concise description:—

It has frequently been pointed out that Continental Governments make much better provision for popular and educational requirements. Some of them print the smaller scale maps in colour. For example, the map of France on the scale of 1-100,000 (about two-thirds of an inch to the mile), published under the direction of the Minister of the Interior, is in five colours—the ground features in sepia, the water in blue, woods green, roads by red lines, and the rest of the detail in black.

The map is one of the most beautiful as well as the most useful that has ever been produced. The amount of information conveyed considering the scale is enormous. The population of every town, village, and hamlet is

given, and special signs indicate where there are post or telegraph offices. The roads are divided into six classes each shown in a different manner, whilst almost every hill, however insignificant, has its altitude indicated in figures, and yet the map is not overcrowded and is perfectly easy to read. For almost every use to which a map on such a scale can be put, it is infinitely superior to the 1-inch ordnance, although each unit of area of the French map represents nearly two and a half times as much of the surface of the country as an equal unit of the British map.

Sir Charles Wilson says that "it must be remembered" in comparing the English 1-inch map with the maps of "other countries, that whilst the latter, on scales analogous to the 1-inch, are military maps, the military character of the 1-inch map has had to give way to the civil requirements of the State." It is difficult to tell exactly what is meant by this, unless it is an attempt to explain the failure of the 1-inch to satisfy either military or civil requirements. The French map referred to is not a military map but a civil map, constructed by a civil department for civil purposes, but the completeness of its information makes it more valuable as a military map than the English 1-inch. Another excuse for the failure of the Ordnance Survey to provide a respectable general map is that our English country is so crowded with detail. "No country" has such an enormous amount of what may be called "artificial detail, buildings, roads, railroads, enclosures, &c., as England." This is a somewhat specious argument. It is necessary to be exceedingly careful of the meaning we attach to words like "detail," "open," "close." Everyone who has been on the Continent knows how "open" the character of the country generally appears owing to the absence of fences and walls which we see almost everywhere in the British Isles. But detail of this kind is as a rule not shown on maps such as those under discussion.

There are many districts in France quite as "crowded" with "detail," which it is necessary to show as any in England. Even if it were not so, the difference in scale, which gives the British map the advantage of 150 per cent. greater area, affords space for much additional detail.

The truth is that in the production of a general topographical map of the United Kingdom, the enterprise upon which it set out more than a century ago, the Ordnance Survey has disgracefully and disastrously failed.

As regards comparative cost, Mr. Crook further tells us that "each sheet of the French map, containing about 390 square miles of country, is sold for 7*d.*; the British 1-inch sheet, containing 216 square miles, costs one shilling, that is to say, the French map per unit of area of ground gives much fuller information in a more readable form, and at one-third of the cost of the British map." Here, then, is a standard of efficiency which may well be held up to the Ordnance Survey for imitation. We may apply to the map of the French Ministry of the Interior, the language formerly applied by a French Commission to our Ordnance Survey, and say that it "*devrait servir de modèle à toutes les nations civilisées*," and especially to our own Survey Department. *Noblesse oblige*; the Ordnance Survey ought never to be content unless it is at least the equal, if not the superior, of all similar institutions. How very far it is from occupying this proud position at present we have shown, and we have shown also that though the Department has its own faults not a few, the primary root of the evil is to be sought elsewhere. The time has come for a radical change of system and a serious endeavour to restore the Ordnance Survey to its old position of supremacy. If that cannot be done, it had better cease to exist. The publication of the new $\frac{1}{4}$ -inch map is really a disgrace to any community which even pretends to be civilised and intelligent; but if it leads to a radical reform in the Survey; its methods and its results, we shall gladly acknowledge that it has not been published in vain.

ORDNANCE SURVEY.

SECRETARY,

It is rather difficult to deal with articles which contain very little definite criticism. The greater part of the two articles in the "Times" of the 4th and 10th June is an expression of opinion, mingled with conjecture as to, and condemnation of, the course which the writer supposes to have been taken by the Treasury and the Ordnance Survey Department. The articles are largely a repetition of the views of Mr. Crook, which were dealt with in a memorandum of Lieut.-Colonel Farquharson, C.B., transmitted with my minute of the 29th April last, on the four-mile map. Those views have already been placed before the Departmental Committee now sitting.

The points which are really criticisms are as follows:—

1. *Gog Magog Hills and Chiltern Hills*.—This is not a hill map, and as the features have not been shown, the names have only been written where there has been plenty of room. When the hills are engraved the names will be written.

2. The enclosures shown are the outlines of woods. To have stamped the trees would have made the map much too heavy.

3. The principal parks were selected. There will always be differences of opinion as to which should be selected.

Heaths, commons, and golfing grounds are not shown, and could not be shown on this scale. The name "Batchworth Heath" is given because it is that of the hamlet, not because it is that of the heath.

4. Ascot is rather a collection of villas and mansions than a "village." The name "Ascot Place" is given, and the locality is sufficiently indicated. Camberley is not a place of first-class importance or a parish name. On a map of this scale it is impossible to show all such names, and the adjoining hamlet of York Town is shown. A single establishment like Wellington College cannot expect to be shown on this scale.

5. This is really the only criticism that is well founded and not matter of opinion. Disused roads should not have been shown. The reason why this has in some instances been done is explained in the memorandum on Mr. Crook's letter, viz., it would not have been possible to wait for a revision of all the roads in England. The omission of many minor roads is unavoidable on this scale unless the map is to be used solely as a road map, which a map on this scale never is.

6. *London*.—The omission of the solid hatching of the London suburbs is not a disadvantage, as it enables the railways, the railway stations, and the names of the outlying districts to appear much more clearly, and the lines of houses along the roads seem to be all that is required. Even as it is, some of the suburban names, such as Stratford, have been left out from want of room to write them. The writer seems to suggest that London should appear as a great black mass without names, instead of, as on the map, a central mass with suburban names. On a map on this scale only the main arteries can be shown in a place like London; it would not be possible to show the Embankment and Northumberland Avenue.

7. The Crystal Palace building is shown by the name "London and Crystal Palace Railway" appears, which seems to be sufficient without adding another name. The name Alexandra Palace has been written, as there happened to be a clear space for the name.

The above seven points, none of which are of vital importance in any map, are the only definite criticisms made on the four-mile map. Some general remarks are added, such as that "we might go on almost indefinitely to point out the faults, defects, omissions, inaccuracies, anachronisms, blunders, and general slovenly execution of this portentously bad map."

I directly traverse this statement, and can do so with all the more confidence that I have had some of the details of the map tested. It is true that the old 1-inch map of the counties south of the Thames is more defective and out of date than that of the rest of England, but taking the country as a whole, the old 1-inch map, especially for such a purpose as reduction to the scale of $\frac{1}{4}$ inch to a mile, is not materially out of date. For instance, there is remarkably little alteration in the lines of the main roads, and hardly any in the general position of the towns and villages, or of the rivers and canals; that is, in probably the most important points for a map on this scale. The "anachronism" consists chiefly in the insertion of railways, which was necessary for the purposes which the map is to serve. The "execution," so far from being slovenly, is equal to the best specimens of engraving produced by the Survey. Perhaps the worst fault of the map is not "omission," but that on some of the sheets more details have been shown than can clearly appear. It is entirely incorrect that, even if these criticisms are just, the money expended upon the map has been thrown away. All the omissions and defects, real or supposed, can be easily remedied on the plates at very moderate cost. Copper-plates are easily corrected, and it would be quite as just

to say that the money spent on the engraving of the new 1-inch map has been thrown away because it does not contain roads and buildings which have come into existence since it was engraved.

The second article in the "Times" of the 10th is mainly taken up with criticism of the action of the Treasury in regard to the Ordnance Survey. The Treasury is, no doubt, able to defend itself; but it may be pointed out that in 1867-8 the Survey Vote was only 88,345*l.*, whereas in 1885-6 it was 260,500*l.*, and even for 1892-3 it is 217,110*l.* I cannot help regretting, from a Survey point of view, that the vote was reduced before Lancashire and Yorkshire had been completed, and before the heaviest part of the arrears of revision had been overtaken, but the Treasury had, no doubt, from their point of view, good grounds for their decision.

The writer quotes the French report of 1867, describing the Ordnance Survey as "œuvre sans précédent et qui devrait servir de modèle à toutes les nations civilisées," and proceeds to show that the praise therein given is not now deserved. This point is the most easily dealt with of all. In 1867 the style and execution of the engraved work were exactly what they are now, that is, no colour was used, and all the complaints made now on this head are as applicable to the maps of that date as they are to the present maps. The progress made with the engraved part of the work was not so great in 1867 as it is now. There was no more revision then than there is now, and the only 1-inch maps of Kent and Cornwall were those of the beginning of the century. At present a new 1-inch map, in outline, exists over two-thirds of England and Wales. But anyone who knows the subject is aware that the French praise of the Survey mainly applied to the town and cadastral surveys ($\frac{1}{5000}$ and $\frac{1}{25000}$ scales) and to the system under which they were made. The town and cadastral surveys are now published in less than half the time from the date of survey that they were in 1867, and in style and execution they are in no way inferior. It is true that the present photozincographed 6-inch maps are not equal to the old engraved maps, but that is inevitable from the mode of producing them, and is amply compensated by the greater rapidity of production, while they are sufficiently clear and useful for all practical purposes. In short it can be definitely asserted that the engraved work of the survey in 1892 is as good as that in 1867, they are, in fact, exactly alike; that the progress in the execution of the cadastral work is much more rapid than it was in 1867; and that for all practical purposes the execution is as good as it was then.

The progress is not the merit of the Ordnance Survey Department beyond showing that it has expended to good effect the increased funds placed at its disposal by Parliament. The truth is that the delays complained of in these articles can be remedied neither by the Treasury nor by the Survey, but by Parliament alone. It is for the latter only to direct that the necessary expenditure should be incurred, to make and keep up to date the publications of the Survey.

A comparison has been made between a French map in colours and the Ordnance Survey maps, to the disadvantage of the latter. It has always been held that in this country maps of that class should be left to the trade, and that Government map making should cease with the publication of the maps authorised. The 1-inch map of England should be compared with the standard map of France on the $\frac{1}{50000}$ scale, and not with a special map. The map printed in colours alluded to is a map on a scale of $\frac{1}{100000}$, prepared by Erhard & Co., the well-known map publishers in Paris, for the Ministry of the Interior. We do not know what the Ministry paid the private firm for producing the map, but it must have been a very large sum. The map is based on the $\frac{1}{50000}$ map of France. If the Local Government Board were to get Mr. Stanford to publish for them a map in colour on a scale of $1\frac{1}{2}$ miles to an inch from the standard 1-inch map of the country and pay him the cost of production, and a subvention to cover the loss of selling copies at a very low price, there would be a parallel case in England.

(Signed) C. W. WILSON,
Colonel.

14/6/92.

Appendix IV.

APPENDIX V.

(See Evidence Q. 156.)

DATES of SURVEY and PUBLICATION of the New Series 1-inch Map.

Appendix V.

TABULAR RETURN of the Sheets of the New Series 1-inch Map of England and Wales, engraved and published in Outline, showing the Dates of Survey and Publication, also the Names of the Counties in each Sheet.

No. of Sheet.	Counties.	Date of Survey.	Date of Publication.	Remarks.
1	Northumberland	1859-60.	1864	
2	"	"	"	
3	"	1860	1865	
4	"	1860-61	1866	
5	"	1860-63	1867	
6	"	1861-64	1866	
7	"	1862	1867	
8	"	1862-63	1867	
9	"	1859-64	1867	
10	"	1859-63	1866	
11	Cumberland	1864	1866	
12	Cumberland and Northumberland	1861-62	1866	
13	Northumberland	1861-63	1866	
14	"	1858-63	1865	
15	"	1858-59	1866	
16	Cumberland	1866	1868	
17	"	1864-66	1867	
18	Cumberland and Northumberland	1861-66	1866	
19	Northumberland, Durham, and Cumberland	1857-62	1866	
20	Northumberland and Durham	1856-60	1865*	* In the cases where the completion of the Survey of the entire area within a sheet was delayed on account of different counties being included, or a special district only being surveyed, the publication of the Sheet was necessarily delayed.
21	"	1855-58	1868	
22	Cumberland	1864-66	1867	
23	"	1861-66	1867	
24	Cumberland, Northumberland, and Westmorland	1859-61	1864	
25	Westmorland, Durham, Yorkshire, Northumberland, and Cumberland	1856-59	1865	
26	Durham	1857-58	1866	
27	"	1856-57	1867	
28	Cumberland	1860-64	1865*	
29	Cumberland and Westmorland	1859-63	1873	
30	"	1858-61	1865*	
31	Westmorland, Yorkshire, and Durham	1854-56	1867	
32	Yorkshire and Durham	1854-57	1865*	
33	"	1853-57	1865*	
34	Yorkshire	1849-53	1873	
35	"	1849-52	1865*	
36	Isle of Man	1867-69	1865*	
37	Cumberland	1860-61	1867	
38	Cumberland, Westmorland, and Lancashire	1846-62	1865*	
39	Westmorland, Yorkshire, and Lancashire	1848-60	1865*	
40	Westmorland and Yorkshire	1848-58	1865*	
41	Yorkshire and Durham	1854	1865*	
42	"	1853-55	1865*	
43	Yorkshire	1849-54	1865*	
44	"	1849	1865*	
45	Isle of Man	1867-69	1873	
46	"	1860	1865*	
47	Cumberland	1846-48	1865*	
48	Cumberland, Lancashire, and Westmorland	1844-58	1865*	
49	Westmorland, Lancashire, and Yorkshire	1847-54	1865*	
50	Lancashire and Yorkshire	"	1865*	
51	Yorkshire	1849-54	1865*	
52	"	1848-54	1865*	
53	"	1848-51	1865*	
54	"	1849-50	1865*	
55	"	1867-69	1873	
56	Isle of Man	"	1865*	
57	"	"	1865*	
60	Lancashire and Yorkshire	1846-50	1858*	
61	Yorkshire	1844-50	1859*	
62	"	1846-53	1858*	
63	"	1846-52	1859*	
64	"	1850-51	1858	
65	"	1849-52	1857	
68	Lancashire and Yorkshire	1844-46	1858*	
69	Yorkshire	1847-50	1858*	
70	"	1845-48	1859	
71	"	1845-52	1857	
72	"	1851-53	1857	
73	"	1852	1889	
79	Lincoln	1885	1890	
80	"	1885-88	1890	
81	"	1886	1890	
85	Cheshire	1872	1887	
86	Cheshire and Derby	1872-80	1887	
88	Lincoln and Nottingham	1885	1890	
89	Lincoln	1885-86	1890	
90	"	1886-88	1890	
91	"	1896-88	1890	
95	Denbigh and Flint	1871-75	1886	
96	Flint and Cheshire	1870-75	1886	
97	Cheshire	1872-77	1887	
98	"	1870-77	1887	

The portions of Lancashire and Yorkshire in Sheets 79, 80, 81, 85, 86, 88, 96, 97, 98, 99, 100, and 101, are not yet published.

No. of Sheet.	Counties.	Date of Survey.	Date of Publication.	Remarks.
99	Cheshire and Derby	1878-80	1887*	
100	Derby and Nottingham	1875-80		
101	Nottingham, Lincoln, and Derby	1875-85	1890*	
102	"	1885-86		
103	Lincoln	1886-88	1891	
104	"	1887-88		
107	Carnarvon, Denbigh, and Flint	1874-75	1887*	
108	Denbigh, Flint, and Cheshire	1869-74		
109	Denbigh and Cheshire	1872-74		
110	Cheshire and Stafford	1871-78		
111	Cheshire, Stafford, and Derby	1871-80	1889*	Mineral district.
112	Derby and Nottingham	1875-84		
113	Nottingham and Lincoln	1877-84	1888*	Mineral district.
114	"	1883-88		
115	Lincoln	1887-88	1891	
116	"	1887		
121	Flint, Denbigh, Merioneth, and Salop	1872-75	1887*	
122	Denbigh, Flint, Cheshire, and Salop	1872-78		
123	Cheshire, Stafford, and Salop	1866-79	1889*	
124	Stafford and Derby	1878-81		
125	Derby and Nottingham	1878-83	1890*	Mineral district.
126	Nottingham, Leicester, and Lincoln	1878-83	1889*	
127	"	1883-87	1891	
128	Lincoln	1886-88		
129	Lincoln and Norfolk	1885-87		
130	Norfolk	1885-86	1890	
131	"	"		
132	"	1885	1888	Mineral district.
137	Denbigh, Salop, and Montgomery	1873-84	1892*	
138	Salop and Flint (det.)	1874-83	1889*	
139	Salop and Stafford	1879-82	1890*	Mineral district.
140	Stafford and Derby	1880-82		
141	Derby, Leicester, Nottingham, and Stafford	1879-83	1889	
142	Nottingham, Leicester, and Rutland	1883-84		
143	Leicester, Rutland, and Lincoln	1883-87	1891	
144	Lincoln and Cambridge	1886-87		
145	Lincoln, Cambridge, and Norfolk	1883-87	1890	
146	Norfolk	1882-85		
147	"	1881-85	1889	
148	"	1880-85		
152	Salop	1880-82	1892	
156	Leicester and Rutland	1883-85	1890	
157	Leicester, Rutland, Lincoln, Northampton, and Huntingdon	1883-87	1891	
158	Northampton, Lincoln, Huntingdon, and Cambridge	1885-87	1892	
159	Cambridge and Norfolk	1883-87	1891	
160	Norfolk	1878-84	1889	
161	"	1880-86	1890*	
162	Norfolk and Suffolk	1880-84		
166	Salop	1877-83	1889*	
170	Leicester, Warwick, and Northampton	1884-85		
171	Leicester, Rutland, Northampton, and Huntingdon	1884-87	1890	
172	Huntingdon and Cambridge	1885-87		
173	Cambridge, Norfolk, and Suffolk	1881-87	1891	
174	Norfolk and Suffolk	1880-83		
175	"	1882-85	1889	
176	"	1882-84		
185	Warwick and Northampton	1883-86	1890	
186	Northampton, Buckingham, Bedford, and Huntingdon	1882-87		
187	Bedford, Huntingdon, and Cambridge	1882-87	1891	
188	Cambridge and Suffolk	1881-87		
189	"	1881-84	1889	
190	Suffolk	1881-85		
191	"	1881-85	1891*	
201	Worcester, Warwick, Oxford, and Northampton	1881-85		
202	Northampton and Buckingham	1880-83	1888	
203	Northampton, Buckingham, and Bedford	"	1887	
204	Bedford, Huntingdon, Cambridge, and Hertford	1876-86	1891*	
205	Cambridge, Hertford, Essex, and Suffolk	1876-86		
206	Suffolk and Essex	1875-85	1890*	
207	Suffolk	1880-85		
208	"	1880-84	1889	
218	Warwick, Worcester (det.), Gloucester, Oxford, and Northampton	1875-84	1890*	
219	Northampton, Oxford, and Buckingham	1875-80	1887*	
220	Buckingham, Bedford, and Hertford	1878-82	1889*	
221	Bedford and Hertford	1876-82	1888*	
222	Hertford and Essex	1875-79	1886*	
223	Essex and Suffolk	1874-76	1887*	W. D. Survey, Harwich district.
224	"	1874-75	1889*	
225	Suffolk	"	1887*	
226	Gloucester and Oxford	1875-84	1891*	
236	Oxford and Berks	1875-80	1886	
237	" and Buckingham	1876-80		
238	Buckingham, Bedford, and Hertford	1872-79	1887*	
239	Bedford, Hertford, Middlesex, and Essex	1866-81		
240	Hertford and Essex	1870-75	1885*	
241	Essex	1873-75	1886*	
242	"	1873-74	1884*	Mineral district.
246	Carmarthen and Glamorgan	1877-78	1888*	

Appendix V.

No. of Sheet.	Counties.	Date of Survey.	Date of Publica- tion.	Remarks.
247	Carmarthen and Glamorgan	1875-78	1888*	Mineral district.
248	Glamorgan	1874-77	1887*	Mineral district.
249	Glamorgan and Monmouth	1868-82		Mineral district.
250	Monmouth and Gloucester	1880-82	1891*	
251	Gloucester and Wilts	1879-87		
252	Gloucester, Wilts, Berks, and Oxford	1875-85	1890*	
253	Oxford, Berks, and Wilts	1875-84		
254	Oxford, Berks, and Bucks	1874-81	1887*	
255	Bucks, Berks, Herts, and Middlesex	1864-77	1886*	
256	Herts, Middlesex, Surrey, and Essex	1863-73	1877*	
257	Essex, Kent, and Middlesex	1862-74		
258	Essex and Kent	1867-74	1888*	
259	Essex	1873	1882	
261	Glamorgan	1875-78	1887*	Mineral district.
262	"	"	"	Mineral district.
263	Glamorgan, Monmouth, and Somerset	1874-82	1890*	Mineral district.
264	Somerset, Gloucester, and Monmouth	1879-85	1891*	
265	Gloucester, Somerset, and Wilts	"	1892*	
267	Wilts, Berks, and Hants	1873-85	1889*	
268	Oxford, Berks, and Hants	1871-78	1882*	
269	Bucks, Berks, Middlesex, Surrey, and Hants	1865-75	1880*	
270	Middlesex, Surrey, and Kent	1863-73		
271	Kent, Essex, and Surrey	1862-69	1876*	W. D. Survey, Gravesend, &c. district.
272	Kent and Essex	1860-67		W. D. Survey, Chatham, &c. district.
273	Kent	1864-73		W. D. Survey, Chatham, &c. district.
274	"	1872-73	1878*	
283	Berks, Wilts, and Hants	1870-79	1882*	
284	Hants and Surrey	1870-73	1880*	
285	Berks, Hants, and Surrey	1867-72	1874	
286	Surrey	1866-71	1873*	
287	Surrey and Kent	1866-70	1879*	
288	Kent	1864-71	1878*	
289	"	1865-73	1879*	
290	"	1871-73	1878	
299	Wilts and Hants	1869-73	1877*	
300	Hants and Sussex	1869-71	1876	
301	Hants, Surrey, and Sussex	1870-76	1880*	
302	Surrey and Sussex	"	1882*	
303	Surrey, Kent, and Sussex	1868-74	1881*	
304	Kent and Sussex	"	"	
305	Kent	1871-73	1879	
306	"	"	1878	
307	Cornwall	1884		
308	Cornwall and Devon	1881-86	1890	
314	Hants and Wilts	1869-71	1880*	
315	"	1859-69	1877*	
316	Hants and Sussex	1859-75	1876*	
317	Sussex	1873-76		
318	"	1873-75	1881	
319	"	1873-75	1880	
320	Sussex and Kent	1871-74	1879	
321	"	1872-74	1880	
322	Cornwall	1882-83	1888	
323	Cornwall and Devon	1882-84	1889	
329	Hants	1867-70	1880*	
330	"	1862-68		
331	Hants and Sussex	1856-61	1876*	W. D. Survey, Portsmouth, and Isle of Wight district.
332	Sussex	1875-76		
333	"	1873-76	1881*	
334	"	"	1880*	W. D. Survey, Newhaven district.
335	Cornwall	1880-82	1888	
336	"	"	1889	
337	Cornwall and Devon	1881-83	1890	
338	Devon	1882-86	1891	
343	Dorset	1886	1892	
344	Hants	1862-63		
345	"	"	1876*	
346	Cornwall	1879-80	1889	
347	"	1879-81	1890	
351	"	1876-77	1888*	
352	"	1877-79	1890*	
353	"	1879	1889*	
354	"	"	1891*	Eddystone Rocks, taken from Admiralty Survey.
356	Devon	1885	1892	
358	Cornwall	1876-77		
359	"	1877-78	1887*	

APPENDIX VA.

SHEETS of the New Series 1-inch Map published with Hills only (no Outline Edition).

Appendix VA.

No. of Sheet.	Counties.	Date of Survey.	Date of Publication.	Remarks.
58	Lancashire	1842-47	1852	Engraved in Outline as an experiment, and published in an incomplete state in outline.
59	"	1844-45	1852	
66	"	1842-45	1847	
67	"	1844-47	1852	

30th July 1892.

C. W. WILSON, Col.

APPENDIX VI.

(See Evidence, Q. 3232.)

COMPARATIVE STATEMENT of Prices of English and Foreign Maps.

Appendix VI.

Country.	Scale.	Size in Inches.	Price.	Price per Square Foot.	Method of Production
FOREIGN MAPS comparing with the 1-inch Ordnance Survey Map.					
Great Britain, England and Ireland	$\frac{1}{83300}$	36 x 24	s. d. 2 6	d. 5	Engraved on copper.
" " "	"	18 x 12	1 0	8	" "
" Scotland	"	24 x 18	1 9	7	" "
Austria	$\frac{1}{75000}$	19 x 15	0 11 $\frac{1}{2}$	5.8	*Heliogravure.
Belgium (engraved)	$\frac{1}{40000}$	32 x 20	3 11 $\frac{1}{2}$	10.7	Engraved on stone.
" (transfers from)	"	32 x 20	2 4 $\frac{1}{2}$ 1 7	6.4 4.3	} Cheap edition.
Denmark	$\frac{1}{80000}$	19 x 15	2 2 $\frac{1}{2}$	13.4	
France	"	32 x 20	1 7	4.3	Engraved on copper.
" (zincographed $\frac{1}{2}$ sheets)	"	16 x 10	0 3	2.7	Cheap edition from zinc.
" (carte vicinale)	$\frac{1}{100000}$	15 x 11	0 7 $\frac{1}{2}$	6.5	Lithographed in colour.
" (Algeria)	$\frac{1}{80000}$	25 $\frac{1}{2}$ x 16	1 2 $\frac{1}{2}$	5.1	*Heliogravure, transference to stone.
Germany	$\frac{1}{100000}$	14 $\frac{1}{2}$ x 11	1 6	16.2	Engraved on copper.
Italy	"	16 x 14 $\frac{1}{2}$	1 2 $\frac{1}{2}$	9.0	*Heliogravure.
"	$\frac{1}{80000}$	15 $\frac{1}{2}$ x 14 $\frac{1}{2}$	0 5	3.2	*Heliogravure.
Netherlands	"	32 x 20	2 6	6.8	Engraved on stone.
Norway	$\frac{1}{100000}$	18 x 14	1 1 $\frac{1}{2}$	7.7	*Heliogravure, transferred to stone.
Servia	$\frac{1}{75000}$	15 x 13	1 2 $\frac{1}{2}$	10.7	Lithographed in colour.
Spain	$\frac{1}{80000}$	23 x 15	5 6	27.6	" "
Sweden	$\frac{1}{100000}$	23 x 17 $\frac{1}{2}$	2 0	8.6	Engraved, and transferred to stone.
Switzerland	$\frac{1}{80000}$	14 x 10	0 9 $\frac{1}{2}$	9.8	Lithographed in colour.
United States	$\frac{1}{82500}$	13 x 18	1 6	11.0	" "

COMPARISON between the Ordnance Survey 6-inch Map and Foreign Maps of 2 to 3-inch Scales.

Great Britain, England and Ireland	$\frac{1}{100000}$	36 x 24	2 6	5	Engraved on copper.
" England	"	18 x 12	1 0	8	Photo-zincographed.
" Scotland	"	36 x 24	2 6	5	Engraved on copper.
Austria			Nil		
Belgium (in colours)	$\frac{1}{70000}$	16 x 20	1 7	8.5	Photo-lithographed in colour.
" (in black)	"	27 $\frac{1}{2}$ x 19	1 2 $\frac{1}{2}$	4	Photo-lithographed.
Denmark	"	13 x 15	0 9	0.7	" "
France			Nil		
" (Algeria)			Nil		
Germany	$\frac{1}{80000}$	18 x 17 $\frac{1}{2}$	1 0	5.5	Engraved on stone.
Italy	"	15 x 14 $\frac{1}{2}$	0 5	3.3	Photo-zincographed.
Netherlands			Nil		
Norway			Nil		
Servia			Nil		
Spain			Nil		
Sweden			Nil		
Switzerland	$\frac{1}{75000}$	14 x 10	0 9 $\frac{1}{2}$	9.8	Chromo-lithographed.
United States			Nil		

* These processes, although described by the same name, differ considerably. Some of them are not unlike photo-zincography.

Appendix VI.

Country.	Scale.	Size in Inches.	Price.	Price per Square Foot.	Remarks.
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FOREIGN MAPS comparing with the 25·844-inch Ordnance Survey Map.

		" "	s. d.	d.	
Great Britain and Ireland	$\frac{1}{2500}$	$38 \times 25\frac{1}{4}$	*3 0	5·4	* Uncoloured, with areas. Zincographed or photo-zincographed.
Austria	$\frac{1}{2500}$	$25\frac{1}{2} \times 20\frac{1}{2}$	2·4	7·5	Engraved on stone.
Belgium			Nil		No foreign country, except Austria, publishes at present any large area of its cadastral map. The Austrian cadastral map is not complete.
Denmark			Nil		
France			Nil		
" (Algeria)			Nil		
Germany			Nil		
Italy			Nil		
Netherlands			Nil		
Norway			Nil		
Servia			Nil		
Spain			Nil		
Sweden			Nil		
Switzerland			Nil		
United States			Nil		

FOREIGN MAPS compared with the Town Maps of the Ordnance Survey.

Great Britain	$\frac{1}{2500}$	$38 \times 25\frac{1}{4}$	*2 6	4·5	* Uncoloured. Zincographed or photo-zincographed.
Austria			Nil		No foreign country publishes any considerable number of town plans on scales as large as 5 feet or 10 feet to a mile.
Belgium			Nil		
Denmark			Nil		
France			Nil		
" (Algeria)			Nil		
Germany			Nil		
Italy			Nil		
Netherlands			Nil		
Norway			Nil		
Servia			Nil		
Spain			Nil		
Sweden			Nil		
Switzerland			Nil		
United States			Nil		

APPENDIX VII.

TABULAR RETURN showing the Town Areas surveyed up to 30th June 1892 in England, Wales, Scotland, and Ireland. Appendix VII.

	Town areas in acres surveyed up to 30th June 1892.			Cost of Work.		Difference in cost between $\frac{1}{25000}$ and $\frac{1}{5000}$ Scales.	Remarks.
	$\frac{1}{2500}$ Scale.	$\frac{1}{5000}$ Scale.	$\frac{1}{10000}$ Scale.	On $\frac{1}{2500}$ Scale.	On $\frac{1}{5000}$ Scale.		
				£ s. d.	£ s. d.	£ s. d.	
England and Wales, not including Lancashire and Yorkshire.	311,463=486 sq. miles			At 4s. per acre. 62,292 8 0	At 15s. per acre. 233,596 10 0	171,304 2 0	The revised and extended 5 feet scale map of London when complete will comprise an area of 115,661 acres = 180.7 sq. miles; this area includes 53,100 acres = 83 sq. miles, which are published but not yet revised.
Lancashire and Yorkshire (finished).	114,002=178 sq. miles			At 5s. per acre. 25,500 10 0	At 20s. per acre. 114,002 0 0	88,501 10 0	
Lancashire and Yorkshire (unfinished).	9,063=14 sq. miles			2,265 10 0	9,062 0 0	6,796 10 0	
England and Wales	59,164=92 sq. miles			At 4s. per acre. 11,830 16 0	At 12s. 6d. per acre. 36,971 5 0	25,140 9 0	
Scotland	31,171=46 sq. miles			At 4s. per acre. 6,234 4 0	At 15s. per acre. 23,378 5 0	17,144 1 0	The City of Glasgow is being at present revised, and the $\frac{1}{25000}$ scale extended. The map will cover an area of 14,170 acres = 22 sq. miles, including 7,920 acres = 12 sq. miles, the area of the existing map.
	20,729=32 sq. miles			At 4s. per acre. 4,145 16 0	At 12s. 6d. per acre. 12,955 12 6	8,809 16 6	
Ireland	33,319=53 sq. miles			At 4s. per acre. 6,663 16 0	At 15s. per acre. 24,989 5 0	18,325 9 0	
	36,647=57 sq. miles			At 4s. per acre. 7,329 8 0	At 12s. 6d. per acre. 22,904 7 6	15,574 19 6	
	409,016=778 sq. miles	116,530=181 sq. miles		129,262 8 0	477,859 5 0	348,596 17 0	

NOTE.—In addition to the above it is estimated that when revision of English and Scotch towns takes place the following additional areas on $\frac{1}{5000}$ scale would have to be added, viz., 29,914 acres to English towns and 5,379 acres to Scotch towns.

Also that 21 new towns in England, containing 7,766 acres, and 33 new towns in Scotland, containing 7,680 acres, will have to be surveyed on the $\frac{1}{5000}$ scale, owing to their having reached a population of 4,000 inhabitants since the last survey.

APPENDIX VIII.

REVISION AND PUBLICATION OF FRENCH MAPS.

Appendix VIII.

FOREIGN OFFICE replies to questions regarding French Maps.

(1.) What steps are taken either by the War Department, the Minister of the Interior, or by any other Government department in France to obtain information from local authorities as to alterations which may occur in roads, railways, buildings, &c., with a view to keeping the Government map constantly corrected?

By what local authorities is this information supplied, and at what periods?

(1.) The staff map on the $\frac{1}{50000}$ scale is the original map from which the other departments of the State have borrowed their materials when they have had to make special maps, such as the $\frac{1}{100000}$ scale map of the Ministry of the Interior, the similar map "du Service Vicinale," and map of the Ministry of Public Works on the $\frac{1}{200000}$ scale.

The Geographical Department of the Army is charged with the maintenance and publication of the map on the $\frac{1}{50000}$ scale. It does so by means of annually revising on the ground about one-tenth part of the country. Officers of all arms are for that purpose detached from their corps for a period of four months. They are chosen for their aptitude for this class of work, and are divided into parties of eight surveyors under charge of a captain. Each party works on the area covered by a single sheet of the map, which, for this purpose, is divided into eight parts. A "chef de bataillon" at the head of the Revision Department inspects the work, sees that it proceeds on uniform principles, and directs on the ground the general operations.

Before the revising officers start, the prefects, the chief engineers of departments, the chief surveyors of roads, and the heads of the different administrative services affected are required to send to the Geographical Department of the Army, by the 1st March, information likely to be of use in revisions (opening of new roads, alterations of their course, opening of railways, canals, &c.).

These reports, often very incomplete and inexact, are only accepted as a general indication. They have to be carefully checked and completed on the ground by the revising officers.

(2.) What is in France the connexion which exists between the Ministry of War which executes the staff map and the Ministry of the Interior which produces the carte vicinale ?

(3.) Are the maps all produced from the same original survey ?

In that case which of the Departments is charged with carrying on the survey, and what sum is allotted to it from the public funds ?

Are the cadastral surveys utilised in the preparation of any of maps specified ?

(4.) The carte vicinale is entrusted to Erhard & Co.

Does this firm work by contract or as a private editor ? Can the agreement between this firm and the State be given ?

(5.) What are the agencies employed for the sale of the official maps, and how are they remunerated ?

(6.) Can the agreement between the State and the firms of Erhard and Hachette be stated ?

(7.) Are there special postal rates for the carriage of maps ?

The map on the scale of $\frac{1}{80000}$ of the Ministry of the Interior is a copy of the $\frac{1}{50000}$ scale. It is kept up to date by means of the revision of the War Ministry and by the help of reports of the road surveyors of cantons. These send to the Map Department of the Ministry of the Interior copies of the $\frac{1}{80000}$ map corrected to show alterations or new lines of vicinal roads to be inserted on the map whenever any important change has taken place in their district.

But the revised edition made by the Geographical Department being much more accurate, because it is made on enlargements of the map on the $\frac{1}{40000}$ scale by officers specially trained in this class of work, is mainly used for keeping up to date the vicinal map.

Lastly, the map of the Ministry of Public Works is equally based on the staff map. It is specially drawn so as to be useful for public works uses; it shows metal works, manufactories, lighthouses, the mean discharge of watercourses, &c. In its publication the work of the officers who revise on the $\frac{1}{80000}$ scale is utilised, and also the information supplied by the engineers of the "ponts et chaussées" of the road surveyors, &c.

(2.) Until now there has been no other connexion between the departments specified than the use made by them of the staff map.

But a year ago a central commission of geographical operations was established at the Ministry of War, whose duty it should be to form a link between the different ministerial departments, which now produce maps and so prevent double work, and to examine into all projects for new maps.

(3.) It has been already explained that the $\frac{1}{80000}$ scale was the original map which had given birth to all the other maps of the Ministry of the Interior and of the Ministry of Public Works.

But the $\frac{1}{80000}$ map started from the topographical drawings on the $\frac{1}{40000}$ scale, the surveyors of which made use of reductions from the cadastral map whenever it was available.

These reductions were completed on the ground by the topographical officers of the staff, who also carried out the triangulation (la géodesie) and the levelling of the map.

It would be difficult to state what the net cost of so colossal a work as the creation of this $\frac{1}{80000}$ map amounts to in respect of its surveys and drawings.

But the net cost of the annual revision on the ground which covers about 22 sheets on the $\frac{1}{80000}$ scale every year may be stated at 60,000 francs.

(4.) The firm of Erhard et Cie is in no respect the editor of the map of the Vicinal Department. This firm only carries out the engraving on stone, from the photographic reduction of the $\frac{1}{80000}$ scale. This engraving on stone allows of the chemical reproduction on copper of the sheets properly drawn. The firm of Erhard works under a contract entered into with the Ministry of the Interior.

(5.) Authorised booksellers whose names appear on the official catalogue of the Geographical Department of the Army are entrusted with the sale of the maps of the Ministry of War. They get a discount of 40 per cent. on the official price of these maps. They must on their part give a discount of 20 per cent. to provincial booksellers who get their stock from them.

The Geographical Department hands over the maps to the authorised agents, but does not receive payment. It is the Treasury which is charged with receiving the value. Every sale agent must also lodge with the Treasury a deposit of 200 francs.

(6.) As far as the Vicinal Department is concerned it is the firm of Hachette which has the monopoly of sale. Only the Ministry of the Interior can explain the contract given to the house of Hachette.

(7.) There is no special tariff for sending maps by post. The articles of this nature come under the same tariff as printed matter and parcels of all kinds.

(Signed) DERRÉCAGNAX,

General,

Sous Chef d'État Major-Général de l'Armée,
Director of the Geographical Department.

APPENDIX IX.

(See Evidence, Q. 5824.)

STATEMENT showing the ITEMS whose cost is charged against PUBLICATION.

Appendix IX.

FIRST EDITIONS.

- (a.) Engraved maps:—
- (1.) Printing from copper.
 - (2.) Hydraulic press.
 - (3.) Electrotyping.
 - (4.) Paper and materials.
 - (5.) Agents' per-centage.
 - (6.) 2½d. per impression for storage.*
- (b.) Zincographed maps:—
- (1.) All zinc work after and including laying transfer.
 - (2.) Printing from zinc.
 - (3.) Colouring pattern.
 - (4.) Examining and measuring impressions.
 - (5.) Colouring impressions.
 - (6.) Paper and materials.
 - (7.) Agents' per-centage.
 - (9.) 2½d. per impression for storage.*
- (c.) Photo-zincographed maps:—
- The same as zincographed maps.

SECOND AND SUBSEQUENT EDITIONS.

- (a.) Engraved maps:—
- (1.) Engraving corrections, &c.
 - (2.) Correcting published sheets.
 - (3.) Printing from copper.
 - (4.) Hydraulic press.
 - (5.) Electrotyping (if required).
 - (6.) Paper, materials, &c.
 - (7.) Agents' per-centage.
 - (8.) 2½d. per impression for storage.*
- (b.) Zincographed maps:—
- (1.) Tracing transfer for zinc.
 - (2.) All the other items specified for first editions of zincographed maps.
- (c.) Photo-zincographed maps:—
- (1.) Photography (if necessary).
 - (2.) Supplying transfer.
 - (3.) All the other items specified for first editions of photo-zincographed work.

* This is an estimated sum intended to cover the cost of the map branch at Southampton.

APPENDIX X.

(See Evidence, Q. 5558.)

ALLEGED ERRORS in WELSH NAMES.

Appendix X.

7, Clarendon Villas, Oxford,

August 3, 1892.

DEAR SIR,

I SEND herewith a list of place-names misspelt in sheet 249 of the Ordnance Survey maps. I have endeavoured to draw up this list in accordance with the suggestions of the Chairman of the Departmental Committee, and I hope the arrangement will be found sufficiently clear. I have not included names about which there may be legitimate doubts, nor those about which I could not get evidence of local pronunciation and usage. I have examined all the sheets of the new 1-inch map of Glamorgan, and I find that sheet 249 is neither better nor worse than the other sheets. Some old blunders have been removed, many have been retained, and not a few very bad blunders have been wantonly introduced. Omissions of important names are numerous and painful to a degree, and consequently the old map (where it can be read) is more useful than the new. In sheet 249 one would be glad to know which way "Nant Cwm Sarn" flows (16); and I cannot trace Nant "Bran" (12) to its source near "Blaen Bran" (415), where it must be as the name indicates.

With regard to the Welsh characters *ll*, *dd*, and *f*, I would follow the authority of our old manuscripts and

adopt *ff*, *ð*, and *v*. Welshmen habitually write *ð** for "dd," but there is a belief among the ignorant section of my fellow-countrymen that to adopt the *v* is to pander to English usage! However, we cannot be swayed by ignorance; and already in names like "Lisvane," "Llandegveth," &c. the *v* cannot be expelled. Care, however, should be taken to use "ff" for the sound of the English "f" in "from." In modern Welsh the distinction is as in the English words "of" and "off." For capitals I would use *ll*, *ð*, and *V*. The character *ll* is extensively used in the old maps. The double use of *th* for different sounds as in "this" and "hath" should be abolished. In Welsh it has always the sound of *th* in "path," never that in "paths." "Llanthewy," "Llandegveth," "Llanhilleth," &c. are intolerable in Wales. By the adoption of these distinctive characters, and by a rational method of spelling, it would be impossible to mispronounce a Welsh word.

Yours faithfully,

J. GWENOGVRYN EVANS.

The Secretary of the
Departmental Committee of
the Ordnance Survey Maps.

LIST of WELSH NAMES in One-Inch Sheet 249, England and Wales, submitted by Mr. J. G. EVANS as incorrect.

	In Map-Spelling.	Division of the Map.	Correct Spelling.	REMARKS.
1	Pont Newydd (twice)	1 and 12.	Bont Newydd - - -	= y Bont Newydd = The New Bridge; while Pont Newydd = a New Bridge.
2	Daren	2	Darren - - -	"Barren" might as well be spelt "baren."
3	Pen-y-gareg - - -	2	Pen y Garreg or Pencarreg -	(According to local usage.)
4	Bargoed - - -	2	Bargod - - -	Even if this were a compound of "coed," both the accent and local usage agree in requiring "Bargod." There was a king named "Pen bargawl" in this neighbourhood.
5	Pen-yr-heol-adam - - -	2	Pen Heol Adam - - -	An impossible use of the article.
6	Gwrhay - - -	3	Gwrhai - - -	(See Liber Landavensis.)—"hay" differs in sound from—"hai."

* Other forms are *ð* and *ð*, but the *ð* has the merit of being in current use in writing and more distinct than the *ll*, at all events. I have never heard any objection to *ff* and *ð*, but to substitute *v* for *f* will probably find a few to object

Appendix X.

—	In Map-Spelling.	Division of the Map.	Correct Spelling.	REMARKS.
7	Craig Cnwce	4	Craig y Cnwce	Cf. "Maes-y-Cnwce" close by.
8	Llanhilleth	4	Llan Hileð.	
9	Tir-pen-twys	4	Tir Pentis	(According to local usage.)
10	Swffryd	4	Swvryd	(Do. do.)
11	Cwm Ynys cou	5	Cwm Ynys Gou	Ynys is feminine and Cou is masculine. But why is the <i>Old</i> Welsh form <i>Cou</i> used here, while the modern form <i>Cau</i> is used elsewhere.
12	Pont-rhydyryn	5	Pont Rhyd yr Ynn.	
13	Croes-wen	6 18	Groeswen or Groes Wenn	According to local pronunciation. (See Division 23.)
14	Llan-Caiach Ho.	8	Glan Caiach Ho.	The house is first named after the brook; then we have the brook re-christened after the house! See No. 28.
15	Llan-caiach Brook	8	Caiach Brook	
16	Graig-evan-leyshon	8	Craig Evan Leyshon.	
17	Gwernau-ganol	9	Gwernau Cenol	The adjective is not mutated when used with the plural.
18	Pont-llan-fraith	10	Pont Glan Vraith.	See No. 28.
19	Twyn y Ganol	11	Twyni Cenol	Twyni is the plural form. Twyn y is the singular, with an impossible use of the article. See No. 18.
20	Craig Gwyn	11	Graig Wenn	Craig is feminine, and Gwyn is masculine.
21	Craig-Ddu	11	Graig Ddu	And "Craig Furnace" should be "Graig Furnace." (Division 11.)
22	Llanderfel	11	Llan D	
23	Lan-yr-afon	12	Glan yr Afon or Glan'ravon	(According to local usage.)
24	Cefn-tila	13	The "tila," a dialectal form	is spelt <i>Tyle</i> everywhere else.
25	Lan-Sor-fawr	14	Glan Sor Vawr.	
26	Graigwith (twice)	14	Graigwith	This word, according to the rule generally followed in this map, should be "Graig-chwith," but the <i>ch</i> is wrong throughout the whole of South Wales. — <i>with</i> is on a par with " <i>wich</i> " for which.
27	Carnedd Llwydion	15	Carneði Llwydion	"Carneð" is singular, while "Llwydion" is plural.
28	Llan-bradach (twice)	16	Glan Bradach.	Under no circumstances can "Glan" be written "Llan"
29	Bedwenarth	15	Bodwennarth	(According to the local pronunciation.)
30	Taren-y-morthwyl	16	Tarren y Mwrthwl.	
31	Gellifanidlogt	16	- - -	An impossible word.
32	Mynydd Grug	17	Mynyð y Grug.	
33	Pen-heol-Sais	17	Pen Heol y Sais	Cf. "Craig y Saeson," Division 33.
34	Twyn-barilwm	18	Twyn Barilwm.	
35	Dyffryn-frynonan	18	Dyffryn Ffynonnð	(According to local pronunciation). — <i>an</i> is certainly wrong.
36	Graig Wenallt	18	Craig y Wennallt.	
37	Melin	19	y Velin	This is a very common mistake, and absolutely wrong.
38	Golo-nos	19	Golen'-os (= Golonnos)	is the local pronunciation.
39	Gollenos	5	- - -	Why is this spelt differently?
40	Croes-y-mwyalch	20	Croes y Vwyalch.	
41	Pont-hir	20	y Bont Hir	This is one of those numerous blunders introduced by railway officials.
42	Pil-bach	20	- - -	Pill everywhere else.
43	Bulmore	21	Bulmoor	This was right in the previous map.
44	Waun-celyn	22	Wean Gelyn or Weun y Celyn	(According to local pronunciation.)
45	Domen Clawdd	22	Tommen y Clawð.	
46	Rhydgwern	24	Rhyd Wern or Rhyd y Gwern.	
47	Alt-yr-y	26	Alt yr Ynn	(According to local pronunciation and sense.)
48	Rhiw-deryn	26	Rhiw'r Deryn	(According to local usage.)

	In Map-Spelling.	Division of the Map.	Correct Spelling.	REMARKS.
49	Maindee - - -	27	Maendy - - -	(Everywhere else) = stone-house. —“ <i>dee</i> ” is gibberish.
50	Bishpool - - -	28	- - - - -	Fishpool in the old map and <i>Vispole</i> in charters.
51	Lis-Werry - - -	28	Lis Wery - - -	? Llys—. “Lis—” is the <i>Old</i> Welsh spelling and may have been fossilised early. Only local usage can decide.
52	Efail-isaf - - -	29	’R Eveil-isa’ - - -	[= yr Eveil.] The article <i>must</i> be used ^{here} .
53	Craig - - - - -	30	y Graig - - - -	Numberless cases.
54	Gwern-ddu - - -	30	Wern Du - - - -	There are numerous cases of Gwern for Wern.
55	Brunant - - - -	30	Briwnant - - - -	Cf. Rhiw.
56	Derwen-dêg - - -	31	Derwen Dêg.	
57	Perth-llwyd - - -	31	Berth Lwyd - - -	Correctly spelt in Division 8.
58	Lisvane - - - -	31	ILys Vaen - - -	There are no mute vowels in Welsh, and as “Lisvane” is purely Welsh, it should be “Lisvân” according to English pronunciation, or Llys Vân according to local Welsh pronunciation.
59	Began - - - - -	32	Begyan.	
60	Graig y Saeson - - -	33	Craig y Saeson.	
61	Cefn-Iogell - - -	33	Cevn Llogell.	
62	Coedcernew - - -	33	Coed Cerniw.	
63	Pen-y-lan-fawr - - -	33	Pennlan Vawr - - -	^{etc etc}
64	Marshfield - - -	—	Maerun vel Meiryn. is the Welsh name, which should be given.	The accent shifts in a compound, and the article is dropped.
65	Wentloog - - - -	—	Gwynllŵg (= “Guinlvin”) -	
66	Cwrt y Betty - - -	2	Cwrt y Betting or Biétin (= Peating).	In most historical documents, and it is so pronounced by Welshmen in the district.

The following place-names I and others can make nothing of:—

Bedllwynog (1); Twyn-giden (1); Pant-y-fyd (2); Ty-pwll (4); Cwm Llickey (5); Coed-y-paen (6); Prescarra (7); Waun-ryd (9); Glan-Shon (11); Coed-y-fon (14); Coed-pen-maen (15); *Egryn*-y-Bwlch (18); and Coed Bald (18). With reference to the last name one would like to know more about the trees or wood (Coed) characterised by the word “bald.” A famous traveller says that certain trees do not “unperiwig” in winter as in England, but one must conclude these were not of the “bald” variety.

It will be useless to call attention to all the various ways of spelling the same name as Llan (31) and Lan (29); Pentre and Pentref; “Ochr-chwith” and “Graigwith;” while hybrids like Pont-y-maen, and Tai-pen-stare are very objectionable. The stare of, the last

word is neither correct English nor Welsh,—it should be either “stair” or “stâr.”

By a “rational method of spelling” I mean that no place-name should be written as one word when it is pronounced as two. For instance, there is a place near Cardiff called “Pen Arth” (with the accent on the second part), and another in North Wales called “Pennarth” (with accent on the first part), but both places are spelt alike in the maps as “Penarth.” Compounds should be written as one word, as Pennarth, Groeswen, Pencarreg, in which the accent falls uniformly on the penultimate; but when the accent falls on the last syllable we should always write Pen Arth, Groes Wen, and Pen y Garreg. Cf. Pencraig (21) and Pen-y-graig (1) in Sheet 249, which I have marked and forward with this list.

J. GWENOGFRYN EVANS.

On this subject see Evidence, Q. 6040–6137.

APPENDIX XI.

MEMORANDUM on the PERMANENT ARRANGEMENTS to be made for the CONTINUOUS REVISION of the MAPS ($\frac{1}{60000}$, 25 inches, and 6 inches) of the ORDNANCE SURVEY. Appendix XI.

By HENRY T. CROOK, C.E.

In devising the arrangements necessary for the “permanent and continuous revision,” it must be recollected that no revision has hitherto been undertaken, and consequently there are enormous arrears to be made up. The new department must not start saddled with these arrears. It is stated that 550,000*l.* is required to bring the arrears to the limit by which the survey in no part of the country shall be older than 15 years. This work might be done on the present system, but for the permanent revision within the 15-year period, it is obvious that entirely different arrangements are required.

The principal desiderata in forming the department are:—

A. It should be constituted as a separate and distinct department with clearly-defined duties. Large surveying operations would seldom be required to be done when the maps are continuously maintained. If town plans have to be extended, or any portion of country to be surveyed on a larger scale than has previously been accorded to it, such operations would be carried out by the central staff of the Survey.

Appendix XI.

- B. The department must be organised in local divisions. The country being divided into convenient districts of a size proportionate to the density of the population and the consequent probability of change.
- C. The Revision Department must be absolutely independent of all county municipal and local authorities, whether contributing to the cost of the survey or not. This is essential to ensure equality and similarity in the plans produced, and to prevent any possibility of suspicion arising that the maps and plans could in any way be tampered with for local or personal considerations.
- D. The superintendent and the employees as far as possible should be permanently stationed in their various districts. The advantage of working in conjunction with the local societies has been amply demonstrated by the assistance which has been given to the survey by the Royal Scottish Geographical Society. There are plenty of local geographical, antiquarian, and other societies scattered up and down the kingdom who would be equally willing and capable of rendering assistance to the Survey in their respective localities. There would be no difficulty in getting a small council of competent gentlemen selected by these societies to voluntarily assist the superintendents of districts in the correct naming and description of local topography and antiquities. There is no doubt whatever that these societies would gladly assist in this way, as it would add increased interest and utility to their work, and improve the maps by preventing errors now made from want of local or special knowledge.

As to the exact size of the districts and the staff necessary to work them, no definite recommendation can be made without further inquiry. At present there is no reliable information to be obtained, as real revision has not yet been undertaken, and consequently there are not even experimental data to go upon.

The method by which the area of towns to be plotted on the 1/500 scale is determined is anomalous and unsatisfactory. The whole question of the relations between the local authorities and the Survey requires to be reconsidered.

When the arrears are brought up to the 15-year limit, it would not appear difficult to devise a scheme which would be equitable to the towns and to the Imperial Exchequer, one by which the total outlay, now incurred separately by each on surveying and mapping, would not be exceeded, while at the same time the maps would be kept up to date and their utility in consequence enormously increased.

It is probable that at the present time in districts where the maps are old that the sum which is spent annually for the authorities of towns of any magnitude on surveying by

the correction of the town map is quite as great as the annual cost of a proper and adequate revision. It would be possible to obtain from a series of typical towns a return showing the annual expenditure of each upon surveying work. Such a return would furnish a good basis from which to calculate what would be a fair amount to ask as a contribution from towns of various sizes. The balance of the cost of the Revision Department would be made up by contributions from other sources or from the Parliamentary grant.

A source of revenue for the Revision Department would be available, if, as I have suggested, its services could be obtained by companies or individuals requiring corrected copies of any maps between the issue of editions. For example, the promoters of public and private schemes of land improvement, water supply, drainage, roads, railways, &c., could be provided with plans corrected in manuscript to date on payment of fees proportionate to the amount of correction required. The Department would thus be paid for obtaining information which it could use afterwards in the publication of new editions.

The Department being localised would soon acquire information of any important changes in the particular district, and by noting and surveying such changes at once, and correcting the official depot copy of the maps, would be in a position to supply almost at any time tracings of any portion of the district with corrections practically up to date to anyone willing to pay for the information. If the edition of any map became exhausted before the expiration of the 15-year period a new corrected edition could be at once published. Thus, where the demand for maps was greatest, new and correct editions would be most frequent.

This scheme applies particularly to the town plans and the 25-inch maps. The publication would be done at Southampton, as at present. The headquarters, being supplied with the latest information with regard to changes, would have all the material for the production of fresh editions of the 6-inch map whenever necessary.

The further contouring and levelling which is necessary would be done by the levelling division; but each district revision superintendent should have a leveller under his orders, and be made responsible for the maintenance of an adequate number of bench marks, for the insertion of levels on new roads, and for the slight rectifications occasionally required in contours where alterations have been made in the ground.

The system which requires the execution and revision of the 1-inch and smaller scales to wait the completion and revision of the cadastral and 6-inch maps has entirely broken down. A new and independent system for the collection of the necessary information for the speedy execution and revision of the small-scale maps is absolutely necessary to meet the requirements of the State and the general public.

APPENDIX XII.

(See Evidence, Q. 565.)

Appendix XII.

TABULAR RETURN showing the ALTITUDES of CONTOURS in ENGLAND and WALES.

County.	Area of Land in Square Miles.	Date of Contouring.	Altitudes of Instrumental Contours.	Altitudes of Sketched Contours.	REMARKS.
Lancashire - -	1,848	1845-51	25, 50, 100, 150, 200, 250, 300, 350, 400, 500, 600, 800, 1,000, 1,200, 1,400, 1,600, 1,800, 2,000, 2,200, 2,400, 2,600 feet.	For 25 feet intervals from 75 to 2,625 feet, excepting where there are instrumental contours.	The remainder of England and Wales (44,824 square miles of land) is instrumentally contoured at altitudes of 50, 100 feet and at 100 feet interval to 1,000 feet.
Yorksh.re - -	6,038	1851-6	25, 50, 100, 150, 200, 250, 300, 350, 400, 500, 600, 800, 1,000, 1,200, 1,600, 2,000, 2,400 feet.	For 25 feet intervals from 75 to 1,200 feet, and for 50 feet intervals from 1,200 to 2,550 feet, excepting where there are instrumental contours.	
Durham - -	816	1858-9	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,250 feet.		
Do. - -	190		25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550 feet.		

County.	Area of Land in Square Miles.	Date of Contouring.	Altitudes of Instrumental Contours.	Altitudes of Sketched Contours.	REMARKS.
Westmorland -	769	1859-61	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,500, 3,000 feet.		
Cumberland -	1,492	1865-6	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,500, 3,000 feet.		
Northumberland -	1,993	1865-6	50, 100, 150, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,500 feet.		
Remainder of England and Wales.	44,824	-	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000 feet.		

TABULAR RETURN showing the ALTITUDES of CONTOURS in SCOTLAND.

County.	Area of Land in County, in Square Miles.	Date of Contouring.	Altitudes of Instrumental Contours.	Altitudes of Sketched Contours.	REMARKS.
Aberdeen and Banff -	2,602	1868-9	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000.		
Argyll -	3,109	1856-9	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,250, 2,500.		
Ayr -	1,131				
Berwick -	457	1857	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500.		
Bute -	218	1875	50, 100, 200, 300, 400, 500, 600, 700, 800, 900.		
Caithness -	686				
Dumbarton -	246	1864	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250.		
Dumfries -	1,068	1857-60	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,500.		
Edinburgh -	368	1853	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000.		
Elgin -	477	1872-3	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000.		
Fife and Kinross -	586	1855	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500.		
Forfar -	873	1865	50, 100, 200, 300, 400, 500, 600, 700, 800, 900.		
Haddington -	267	1854	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500.		
Inverness -	4,211	1872-5	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000.		
Kincardine -	382	1865-6	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000.		
Kirkcudbright -	897	1850-4	25, 50, 100, 150, 200, 250, 300, 350, 400, 500, 600, 800, 1,000, 1,200, 1,600, 2,000, 2,400.	For 25 feet intervals from 25 to 1,200 feet. For 50 feet intervals from 1,200 to 2,650 feet.	Excepting where there are instrumental contours
Lanark -	876	1861-3	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500.		
Linlithgow -	120	1856	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000.		

Appendix XII.

County.	Area of Land in County, in Square Miles.	Date of Contouring.	Altitudes of Instrumental Contours.	Altitudes of Sketched Contours.	REMARKS.
Nairn - -	193	1871	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000.		
Orkney and Shetland	928				
Peebles - -	348	1857-9	450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,500.		
Perth and Clackmannan.	2,540	1862-6	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000.		
Renfrew - -	243	1860-2	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250.		
Ross and Cromarty -	3,089	1875-7	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000.		
Roxburgh - -	665	1860-2	100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000.		
Selkirk - -	266	1863-4	300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000.		
Stirling - -	450	1860-2	50, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750.		
Sutherland - -	2,028				
Wigtown - -	485	1847-50	25, 50, 100, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1,000.	For 25 feet intervals from 75 to 1,000 feet.	Excepting where there are instrumental contours.

TABULAR RETURN showing the ALTITUDES of CONTOURS in IRELAND.

County.	Area of Land in County, in Square Miles.	Date of Contouring.	Altitudes of Instrumental Contours.	Altitudes of Sketched Contours.	REMARKS.
Donegal - -	1,835	1847-53	50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,200, 1,400, 1,600. 32, 57, 107, 157, 207, 307, 407, 507, 607, 707, 807, 1,007, 1,207, 1,607, 2,007, 2,407.	For 25 feet intervals from 25 to 1,675 feet. For 25 feet intervals from 82 to 2,407 feet.	Excepting where there are instrumental contours.
Dublin - -	353	1870-2	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000, 2,250.		
Londonderry -	801	1848-54	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 700, 800, 900, 1,000, 1,100, 1,200, 1,400, 1,600, 2,000.	For 25 feet intervals from 125 to 2,225 feet.	Excepting where there are instrumental contours.
Tyrone - -	1,211	1853-6	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, 1,750, 2,000.		
Antrim - -	1,109	1855-7	25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,250, 1,500, and 1,750.		
Louth - -	316	1861-6	25, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1,000, 1,100, 1,200, 1,300, 1,400, 1,500, 1,600, 1,700, 1,800, 1,900.		
Kilkenny - -	792	- -	30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 900, 1,000, 1,100, 1,200, 1,300, 1,400, 1,500, 1,600.		

APPENDIX XIII.

CIRCULARS.

CIRCULARS ASKING FOR OPINIONS AS TO COLOURING OR CROSS-RULING OF HOUSES OMISSION OF TREES, AND NUMBERING OF PLOTS AND INSERTION OF AREAS.

Copies of the Circular which follows were sent to 319 landowners, agents, surveyors, civil engineers, and other gentlemen.

Departmental Committee on the Ordnance Survey.
3, St. James's Square, S.W.,
June 1892.

The town plans of the Ordnance Survey on the scales of $\frac{1}{500}$ (about 10 feet to the mile) and 5 feet to the mile, and the map on the scale of $\frac{1}{2500}$ (about 25 inches to the mile) are now published in two forms, namely, in skeleton, with no indication as to which spaces are houses, or yards, or streets, see Figs. 1 and I uncoloured on annexed specimens; and the same map coloured, showing the buildings distinct from open spaces, see Figs. 1 and I coloured. The one form (skeleton) costs, if without areas, 2s. 6d. per sheet—the other, which is more intelligible, runs up in extreme cases to as much as 1l. per sheet, according to the amount of buildings to be coloured. The great cost of these coloured sheets is complained of.

It has been suggested to the Committee that instead of this arrangement the buildings be cross-ruled, see Figs. 2 and II. In this case neither skeleton nor coloured impressions would be issued. The map would be in one form only, and the price would be slightly higher than that of a skeleton impression uncoloured, which costs 2s. 6d. without areas, or 3s. with areas.

In some cases town plans are already published with the houses cross-ruled, in which cases no alternative form is published.

The ruled sheets, Figs. 2 and II. are necessarily coarser in appearance than the other Forms 1 and I.

It has also been suggested to the committee that hedge-row timber, single trees, and trees and shrubs round houses, should be omitted from the Ordnance Survey plans.

It has been represented that it is in no case of much value to show such trees on the Ordnance Survey plans, and that for some purposes it is inconvenient. Trees add materially to the expense of survey.

Your opinion is therefore desired on the following points:—

(1.) Whether you would prefer (1.) Ans.
an edition with houses cross-ruled?

(a.) For the $\frac{1}{500}$ (or 10-ft.) town maps.

(b.) For the $\frac{1}{1056}$ (or 5-ft.) town maps.

(c.) For the $\frac{1}{2500}$ (or 25-inch) maps.

(2.) Or whether you think it (2.) Ans.
best to retain the double form as at present, viz., one coloured and the other uncoloured?

(a.) For the $\frac{1}{500}$ (or 10 ft.) town maps.

(b.) For the $\frac{1}{1056}$ (or 5 ft.) town maps.

(c.) For the $\frac{1}{2500}$ (or 25-in.) maps.

(3.) Is it desirable that hedge- (3.) Ans.
row trees, single trees, and trees and shrubs round houses, should be shown as at present on the Ordnance Survey town maps, also on the 25-in. and 6-in. scale maps, or would they be better omitted?

The ordinary indications of woods and orchards would, of course, be given.

Please answer separately in respect of each class of map.

To

Signature

Date

To this Circular 220 answers were received. It is not possible to do more than indicate the general drift

of the answers received, as in a good many cases the answers were qualified so as to render it impossible to tabulate them. It may be stated however that:—

On the question whether it is desirable to issue the large scale plans as at present in double form with houses coloured and plain, or to issue them in one form only, viz., cross-hatched, the opinions elicited were strongly in favour of cross-hatching—the proportion in favour of that course being about five to one.

On the question whether trees should be shown in hedgerows, round houses, &c. or not, there was a very large majority, amounting to nearly three to one that such trees would be better omitted altogether, or that there was no sufficient reason for retaining them.

CIRCULAR ON AREAS.

Copies of the Circular which follows were sent out to 272 landowners, agents, surveyors, civil engineers and other gentlemen.

AREAS.

Departmental Committee on the Ordnance Survey,
3, St. James's Square, S.W.,
June 1892.

The different enclosures and plots on the Ordnance Survey maps on the scale of $\frac{1}{2500}$ (25·344 inches to the mile) have from the first had numbers marked on them, running as far as possible consecutively throughout parishes, each parish having a separate set of numbers.

The areas of the enclosures so numbered were at first given in an area book, which was sold separately.

Subsequently the area books were discontinued, and the areas were stamped on the maps inside the enclosures; a sum of 6d. being added to the price of each map to cover the cost of stamping.

It has been very strongly represented to the Committee that the labour, cost, and delay entailed on the Ordnance Survey Department by this system of numbering has been very great, whilst the utility for purposes of reference is not so clear, as no permanence can be secured for these numbers. They also to some extent encumber the map. Whenever any alteration is made in the boundaries of a parish, and when any revision of the map takes place, the numbers have to be altered, and new ones adopted, and the existing sheets become obsolete. It will thus be seen that any reference to the numbers in deeds and other documents becomes misleading, unless the date of the Ordnance Survey map is quoted.

(1.) A partial remedy for this defect would be to number the enclosures by sheets instead of by parishes, the result of which would be that the numbering would not be affected by alterations in the boundaries of existing parishes, or by the formation of new ones, but would be disturbed only in the case of alterations on revision.

(2.) The most complete remedy, however, for the defect would be to abolish the numbers altogether, and insert the areas only on the face of the plans. In the case of reference being required to the different enclosures for deeds and other documents, it is believed that the reference might be made to the areas stamped on the enclosures instead of to the numbers as is now the case. There would practically be no danger of the figures on any two areas on the same sheet coinciding, considering that there are three places of decimals for each area printed. There would be of course nothing consecutive in the area figures, but it must be borne in mind that the present numbers are in many cases not consecutive, especially in cases where it has been necessary to disturb the original numbering. Any map, or portion of a map, attached to a deed may have its enclosures numbered to suit the circumstances of the case.

It is be remarked that when the areas are stamped on the plans they have often, for want of room, to be omitted on small enclosures, on which there would be room for the number of the enclosure.

Appendix XIII.

Your opinion is requested :—
(1.) As to whether the present system of numbering each separate enclosure on the Ordnance maps should be continued?
(2.) If so, should the numbers be by parishes or by sheets?
(3.) If the numbers are retained:
(a.) Should the areas be stamped on each enclosure on the plan, or
(b.) Should they be given in a separate area book?

To

Signature.
Date.

To this Circular 202 replies have been received.

On the question as to whether reference numbers should be retained or not, a strong majority, about two to one, were in favour of doing so. It may, however, be inferred from the answers that in some cases, at least, this was due to the opinion that area books should be printed, in which case reference numbers are a necessity.

On the question whether numbering, if retained should be by parishes or by sheets, there was a slight majority in favour of numbering by parishes.

On the question whether the areas should be given in a separate area book or stamped on the face of the plan, there was a slight majority in favour of the latter.

DUNCAN A. JOHNSTON,
Major, R.E.

November 1892.

APPENDIX XIV.

(See Evidence, Q. 47.)

Appendix XIV.

DISTRIBUTION of the EXPENDITURE out of the VOTE for SURVEYS of the UNITED KINGDOM from 1880-81 to 1891-92.

	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.
	£	£	£	£	£	£	£	£	£	£	£	£
Cadastral Survey - -	108,998	149,497	166,134	188,217	192,819	192,924	191,751	149,583	95,393	65,847	30,008	24,526
Revision of the Survey of Great Britain.	—	—	—	—	—	—	1,035	18,529	62,376	79,987	98,646	100,713
Revision of Irish Survey -	8,565	9,644	10,421	10,481	10,771	12,390	13,050	12,739	13,514	15,461	28,413	38,093
Maps for Land Judges' Court, and Land Commission from 1890-91	5,748	3,168	3,084	3,890	4,006	3,534	3,426	3,440	3,153	3,488	3,153	3,572
Publication of Maps - -	17,581	18,945	23,919	29,695	33,367	35,770	37,712	40,914	41,647	45,434	46,801	44,871
Engraving Geological Survey -	888	809	901	900	1,053	936	1,059	1,026	1,127	1,194	980	973
Special Services for other Departments.	1,436	2,419	2,350	1,734	5,405	4,947	1,513	3,631	5,008	2,546	2,592	2,909
Total - - -	141,211	184,482	206,809	229,417	247,511	250,501	249,546	229,862	222,218	214,262	210,341	215,754

1st November 1892.

(Signed) C. W. WILSON,
Colonel.

APPENDIX XV.

(See Evidence, Q. 5792.)

Appendix XV.

RELATIVE COST of PUBLICATION of TOWNS on the 10·56-foot and 25·344-inch scales.

Relative cost of publishing 25 town plans (960 acres) on the 10·56-foot scale, and that of publishing one plan of the same area (960 acres) on the 25·344-inch scale. The cost of publishing 25 town plans on the 10·56-foot scale by photo-zincography, is ten times the cost of publishing one (25·344 inch) scale plan of the same area.

(Signed) C. W. WILSON,
Colonel.

1st November 1892.

APPENDIX XVI.

(See Evidence, Q. 5826.)

Appendix XVI.

ESTIMATE of the PRICE at which a close sheet on the 25·344 (25·344 inch) scale plan of Birmingham could be produced with houses cross-ruled.

Impressions of the sheet in question could be sold, cross-ruled, at 5s. each.

(Signed) C. W. WILSON,
Colonel.

December, 1892.

APPENDIX XVII.

MAPS ON THIN PAPER.

Appendix XVII.

SIR,
It has since occurred to me that the idea of printing the 25-inch Ordnance Plans on very thin paper might after all be a boon to the public, though I did not think so at the time of giving evidence. For instance, the plans might be folded into letters, and thus sent more conveniently by post; also, where it is necessary to prepare plans on vellum for the conveyance of properties, the thin paper would enable me to transfer the work required direct, without first making a tracing of it, as is necessary now. The paper would need to be very thin for this, in fact a tough tracing paper; the

kind known as "*Unprepared thin white*" appears to me the most suitable for the purpose, as it does not get brittle like other kinds of tracing paper.

I am sorry I did not think of this at the time, and fear it may be too late now to be of any practical value.

I am, &c.
(Signed) G. H. LEANE.

To Major Duncan A. Johnston, R.E.,
Secretary, Departmental Committee on
the Ordnance Survey.

APPENDIX XVIII.

SALE of TOWN PLANS.

Appendix XVIII.

RETURN showing the Sales of the 10·56-foot (1/500)
Scale Plans of 14 Towns, from 1866 to 1886
inclusive.

Town.	No. of Sheets.	Date of Publication.	No. of Impressions sold.	Average Sale per Annum per Sheet in each Town.
Barrow -	57	1874	526	·7
Birkenhead -	81	1876	1,510	1·7
Carlisle -	18	1866	527	1·40
Chatham -	55	1867	698	·6
Cheltenham -	128	1885	614	2·4
Cardiff -	117	1880	1,011	1·2
Dorking -	13	1879	170	1·6
Folkestone -	21	1873	338	1·1
Northampton -	57	1885	502	4·4
Nottingham -	352	1882	5,460	3·1
Oldham -	167	1880	2,273	1·9
Rhyl -	18	1878	226	1·4
Southampton -	40	1870	1,007	1·4
Stoke-on-Trent -	77	1879	387	·6
Average sale of the 14 towns -	—	—	—	1·7

(The following Return was prepared for the Departmental Committee on the arrangements for sale of the Ordnance Survey maps, of which Sir George Leach, K.C.B., R.E., was President.)

RETURN showing Average Annual Receipts from the Sales of Town Maps on Scales of 5 feet to the mile and upwards.

ENGLAND AND WALES.—AVERAGE ANNUAL NET RECEIPTS.

	Per Year.	Per 100 Acres.	Per Sheet.
		s. d.	s. d.
1875 to 1879	-	9 2	3 6
1880 to 1884	-	8 8	3 5
1887 to 1891	-	5 10	2 3

APPENDIX XIX.

(See Evidence, Q. 6136-7.)

WELSH NAMES.

Appendix XIX.

Park Lane, Denbigh,

DEAR SIR, November 19, 1892.

YOUR letter of yesterday's date to hand.

I can with great satisfaction and truth say that the names, generally speaking, of Welsh farms and places are correctly spelt, and that there is not the smallest difficulty in identifying the places. In point of fact, if I am in the least in doubt as to the proper way of spelling the Welsh names I am in the habit of consulting the Ordnance Survey for confirmation.

I have the whole of the 6-inch plans of the county of Denbigh, and a great many of the 25-inch. I have also

several sheets of the 6-inch and 25-inch plans of Carnarvonshire.

I have found no incorrect spelling.

I think it would be a very great mistake to introduce any new characters, as the plans are much more understandable in their present form; and I sincerely trust that until any new characters are thoroughly understood by the Welsh people generally they will not be made use of for the Ordnance Survey.

I am,
Yours faithfully,
R. LLOYD-WILLIAMS.

APPENDIX XX.

WELSH NAMES.

Appendix XX.

LETTER from THOMAS GEE, Esq., J.P., Chairman of the County Council of DENBIGHSHIRE, in reply to questions addressed to him by the COMMITTEE.

Duncan A. Johnston, Esq.,
3, St. James' Square, London.

DEAR SIR, Denbigh, December 21st, 1892.

I HAVE examined several of the Ordnance Maps you sent me, and am glad to find the names so correctly given. There are a few exceptions, which

E 71935.

it would be well to correct—several of which are included in Mr. Gwenogfryn Evans' Appendix XX., though I do not agree with him in all the changes which he suggests. I however feel assured that future historians would be greatly assisted in their investigations if the names could be depended upon as to their general accuracy, and they would also be most accept-

K k

Appendix XX.

able to my fellow countrymen in all parts of the principality.

The rules which are contained in the Ordnance Survey Instructions to Field Examiners on the orthography of Welsh names are very good—and no fair objection can be made to them. This is the orthography which has been mostly adopted by the British and Foreign Bible Society in the editions of the Welsh Bible which that society has published, and it is adopted by many Welsh scholars. It has also the authority of the late Rev. Thomas Rowland, who was the author of one of our best grammars.

As to the changes which Mr. Gwennogfryn Evans proposes in the characters *ll dd* and *f*, I would not advise the Ordnance Survey Committee to adopt them. They do not appear in any important works which have issued from the Welsh press during the last half century at least; and I do not think it would be possible to induce any publisher to make these changes in any of his works at the present day. Our great lexicographer, the late Dr. Owen Pughe, made a great effort to introduce a number of changes of a similar nature at a time when his influence was very great—but he failed, and gave up the attempt, as appears from his short preface (which I have enclosed) to the second edition of his great Welsh and English Dictionary.

I congratulate the Ordnance Survey Committee upon the care which appears to have been taken with the names of places in these splendid maps, and have not the least doubt but that they will be greatly valued in their present state.

I am, &c.
(Signed) THOMAS GEE.

LETTER from OWEN S. WYNNE, Esq.

Dol'rhyd, Dolgelley,
December 23rd, 1892.

DEAR SIR,

THE county surveyor of Denbighshire has forwarded your note to me, and asked me to write to you in reply. I have seen *many* of the new 25-inch Ordnance maps and *have* many of them, and, as far as I have seen, the spelling of the names is very correct. Of course there may be an *occasional* mistake, but on the whole it is *wonderfully* good, and as regards introducing such letters as *B, ð, U, &c.*, I do not think it would be advisable.

Believe me, &c.

(Signed) OWEN S. WYNNE.

Major Tuncan A. Johnston, R.E.

LETTER from WALTER B. C. JONES, Esq.

Estate Office,
Criccieth, North Wales,
December 23rd, 1892.

MY DEAR SIR,

I REALLY think the names on the Ordnance sheets are very well spelt, and I do not think an ordinary Welshman could improve upon them. I am strongly of opinion that the introduction of the characters suggested by Mr. Evans would add nothing to the appearance or facilitate the spelling. It is to be hoped that many besides my own countrymen will consult the sheets.

Believe me, &c.

(Signed) WALTER B. C. JONES.

To the Secretary of the
Committee on the Ordnance Survey.

INDEX AND ANALYSIS OF THE EVIDENCE.

*N.B.—In this Index the figures following the names of the witnesses refer to the questions of the Evidence, except where the letter p. occurs when they refer to the paging.
The Appendices to the Evidence are referred to by numerals, the Appendices to the Report by letters.*

A.

ACCURACY:

Every part of the Survey ought to be accurate within a limit of error of two links in the thousand, *Wilson*, 93. In large-scale plans errors are exceedingly rare, *Crook*, 1092-3. The 25-inch map is very accurate, *Wheler*, 2081. Has never hesitated to accept the accuracy of boundaries, *ib.* 2086. Can hardly conceive of a survey more technically perfect than ours, *Geikie*, 3007, 3023. Has never found a mistake in the 5-foot map of London, *Murray*, 3117. The 6-inch map is so absolutely correct that you are perfectly certain at arriving on the ground at the result you have come to on the map, *Cooper*, 3537-41. Considers the correctness of the 25-inch map wonderful, *ib.*, 3629. Has found the maps generally very accurate, *Leane*, 3741-6. The number of errors is infinitesimally small, *Leach*, 4047. Makes no complaint as to correctness of the maps, *Allison*, 4303. The inaccuracies are infinitesimal, *Fuller*, 4880. Has never found anything inaccurate in the 25-inch map, *Merivale*, 5267.

ADMIRALTY SURVEYS:

To what extent the Ordnance maps are made use of in preparing the Admiralty surveys, *Wharton*, 4957-64. The relations of the Admiralty with the Ordnance Survey Department leave nothing to be desired, *ib.*, 5041-2.

AGENCY:

Explains terms of his contract and his system of sale to sub-agents, *Stanford*, 2393-2411. Their agent is allowed 44 per cent. on the sale of Admiralty charts, the 33 per cent. allowed to Stanford is not sufficient, *Wharton*, 5047-61. Sells his maps to agents at half-price, *Bartholomew*, 1661, 1765-6. The French agents are allowed a commission of 40 per cent., *Crook*, 1555.

The Department ought to exchange obsolete editions of maps, as is done by the trade, *Wyld*, 2990-7. The Admiralty exchange their cancelled charts, *Wharton*, 5055.

The present system of agency is not satisfactory to the trade nor to the public, *Wyld*, 2967 *et seq.*

The agent's name and address might be printed on each map, *Stanford*, 2701-14.

See APPENDIX VIII.; COLOURED IMPRESSIONS; SALE OF MAPS.

ALLISON, Mr. J. (Analysis of his Evidence.)

Is a civil engineer and borough surveyor of Manchester, 4286.

Revises his town map every two or three years, putting in buildings in block, 4290-3.

Observations as to how far the State can be expected to pay for the revision of town plans, 4289, 4298-4300, 4307-8.

Does not think the plan of getting the town to send tracings of alterations to the Survey once a year would be a satisfactory arrangement, 4294-6, 4310. It would be better to compel towns to keep up their town surveys correctly and send tracings of the corrected Ordnance sheets to the Department, 4311-2. The cost of this would not be heavy, 4314-5. Thinks that the Survey should not accept any work sent in without testing it on the ground, 4319.

Thinks that towns should be revised every 10 years, agricultural districts every 30 years, 4289, 4320-1. Does not think that continuous revision of town plans by the Survey from local centres is practicable, 4323.

The extension of the minor triangulation to growing districts outside the town would be a great assistance, but thinks Government ought to make a complete survey, 4330, 4336. The 25-inch scale would suffice for some time for such districts, 4331-2.

Has nothing to complain of as to the correctness of the plans, 4303-4. Complains of the general style of the new 10-foot plans and contrasts them with the old engraved 5-foot plans, 4289, 4337-9, 4382-6.

Objects to the black-shaded line to buildings, 4341-3. If the hatching were finely done one edition of town plans hatched would answer all purposes, 4344-51.

Complains that the detail of railway viaducts and underground waterways are not shown, 4289, 4352-8.

Paths and trees in gardens should be omitted, but isolated trees in the country should be correctly surveyed, 4367-74. It is not necessary to show the interiors of public buildings, 4354-6.

Thinks that the new 10-foot plans are too dear as compared with the old engraved maps, 4365.

Complains that the paper now used is rough and brittle; requires a drawing paper which he can work on, 4375-81.

AREAS:

1. General.
2. Whether preferable to stamp areas or plans, or to publish area books.
3. To what extent reference numbers are useful, and whether or not it is advisable to retain them.
4. As to necessity of re-numbering parcels when boundaries are revised, and the confusion caused thereby.
5. Whether parcels should be numbered by sheets or parishes.

1. General.

When area books were abolished the Land Department asked that the reference numbers might still be kept on the plans, *Wilson*, 5865. Explanation of the Irish system of numbering parcels, it is a very perfect system, *ib.* 299, 5858-62. The price of maps with areas on has been increased by 6d., *Stanford*, 2458. With what degree of accuracy areas can be computed from town plans, *Fuller*, 4927-38.

It is very desirable to show the areas of smaller plots, especially in populous places, *Wheler*, 2163-8. It is impossible for the Department to inquire locally as to the correct bracing of parcels; if cases of parcels being wrongly braced are pointed out the plans are corrected, *Wilson*, 470-4. It is impossible for the Department to number each parcel separately, as is done in French maps, because they have no means of ascertaining property boundaries, *Johnston*, Major, 3219 *et seq.*

2. Whether preferable to stamp areas on plans or to publish area books.

Areas on plans are of great importance, *Fuller*, 4263. Areas on plans are preferable, *Ryde*, 4442; *Binnie*, 5221; *Leach*, 3900. It is much more desirable to have areas on plans, *Stanford*, 2463. Area books are undesirable, *Johnston*, 2812.

Area books are preferable, *Leane*, 3766 *et seq.* Prefers area books, but would like areas on plans as well, *Wheler*, 2100-16.

3. To what extent reference numbers are useful, and whether or not it is advisable to retain them.

Parcel numbers are at present omitted from the 25-inch plans of Ireland, *Wilson*, 5851. Reference numbers are no good if there are no area books, *Leane*, 3767. Engineers would sooner be without them, *Binnie*, 5216. From a survey point of view it would be

better to omit the numbers, *Wilson*, 5853-4, 5863-4. If numbering must be altered, it would be best to omit it altogether and allow overseers to insert their own, *Fuller*, 4885-90. The numbers are not sufficiently useful to justify a large extra expenditure in retaining them, *Ryde*, 4452-5, 4445. Numbers are of no service for the purposes of local assessment, *ib.*, 4467-8.

The discontinuing of reference numbers would be a great loss, *Wheler*, 2127. Reference numbers are used in the Land Registry Office, *Leach*, 3875; *Brickdale*, 5925.

4. *As to necessity of re-numbering parcels when boundaries are revised, and the confusion caused thereby.*

In the great bulk of the country there will be no change in the numbering, *Leach*, 3879-81. When parish boundaries are altered, the reference numbers have to be altered also, *Wilson*, 292, 301-4, 5856; *Ryde*, 4451; *Fuller*, 4899. This will cause great confusion, *Wilson*, 297. Change of numbering would cause future trouble in conveyancing, *Brickdale*, 5927-8.

5. *Whether parcels should be numbered by sheets or parishes.*

The Land Department has always insisted on the numbering of parcels by parishes, but the work would be greatly simplified if they were numbered by sheets, *Wilson*, 292-6, 5857. Is strongly of opinion that numbering should be by parishes, *Leach*, 3896. Sees no objection to numbering by sheets, *Wheler*, 2129.

See Appendix XIII.

B.

BARTHOLOMEW, Mr. J. G. (Analysis of his Evidence.)

Is a cartographer of Edinburgh, and has had great experience in the making of maps, 1588-90.

Describes a plan of Edinburgh on a scale of 15 inches to a mile he made, and how it was produced, 1591-7. Almost a fourth of the work was specially surveyed, 1594. Made large use of the work of the town surveyor and found it correct enough, 1598-605.

Describes the 12-inch plan of Glasgow he is now producing for the corporation, 1612-21. Thinks that the omission of small details in his maps is an improvement, 1629-32. His maps are engraved on copper, and printed from stone, 1638-9, 1835-41. Thinks for general purposes it is much the best method to print from stone, 1872.

Is of opinion that the revision of town plans could be well and accurately done by, and at the expense of, the local authorities, 1627-9, 1633-5. Finds that the 1-inch map requires a great deal of correction for tourist purposes, 1649-52. Thinks it should be revised annually, three surveyors would do the work in Scotland, 1682. This revision should be kept distinct from that of the larger scales, 1683, 1823.

In many cases gives the phonetic spelling as well as the Ordnance spelling on his maps, 1662-4. Has heard great dissatisfaction expressed with the Ordnance spelling, 1665-6.

Complains that the Survey does not train apprentice engravers, and takes away his men, 1692-5, 1893-8. Draws attention to one or two omissions in the 1-inch map, 1698-702; see *Wilson*, p. 221.

Discusses the comparative merits of contouring and hill-shading for representing hills, 1696, 1704-14. Thinks the most perfect way is by tinting between the contours, 1715-20.

Is not in favour of colour printing for the outline of maps, because it is impossible to insure accuracy in registering, 1725-6. Discussion as to whether contours can be printed with advantage in colour, 1727-35. Prefers them absolutely correct in black, 1736.

His ideal 1-inch map would have contours in black, hill-shading in brown, with tinting to distinguish comparative heights, 1738-53.

Thinks that the small sale of 1-inch maps is mainly due to the fact that they are not brought before the public notice, 1654, 1659, 1754-61. The trade find it more profitable to sell the maps of private publishers who give a discount of 50 per cent., 1661, 1765-6.

Thinks that a distinction should be made between public and private roads, 1767-72. Has tried to do it

in one or two cases, but it involved them in legal proceedings, 1770.

Considers that arrangements should be made with private firms to produce cheap maps in popular forms, but that the Survey should continue to produce their official maps, 1780-3, 1791-5, 1878-82. The mere photographic reproduction of the 1-inch map should not be allowed, 1686-9, 1785-90. Opinion as to what constitutes an infringement of the copyright in the reproduction of Ordnance maps, 1805-14. The production of maps on a smaller scale than the 1-inch should be left to private firms, 1784.

Generally speaking thinks that our survey is quite as satisfactory as any he knows, 1819, 1825. Thinks the publication of maps would be done quicker and cheaper if put out to contract, 1830-4.

Has not had much experience of zinc, but thinks better work is got from stone, 1844. Observations on the time required for, and the cost of engraving, 1846-8. Speaks very highly of the present engraving of the 1-inch map, but generally speaking thinks no engraving is now as good as it used to be, 1854-64.

Considers the style of the new 1-inch map quite satisfactory, better and clearer than the old 1-inch, 1861, 1865. Asks for two editions of the 1-inch map, one on drawing paper and the other, for tourist purposes, on a thin Manila paper, like that the *carte vicinale* is printed on, 1873-7.

Thinks that photo-lithography or photo-zincography is the simplest method of producing plans on larger scales than the 1-inch, it is pure extravagance to engrave them on copper, 1883-5.

Asks that the revision of the 6-inch maps of large towns be entrusted to private firms who now do the work for publishing in directories, 1886-90. Asks for permission to reproduce a 1-inch sheet in colour, 1899-907. Points out the great difficulty in the way of the Survey adopting improvements, 1907. Would like the depths of lakes contoured, 1910.

BENCH-MARKS :

General description and number of bench-marks and where they are put, *Wilson*, 393-407, 465.

In the re-survey of Yorkshire and Lancashire it was found that one-third of the bench-marks had been destroyed and one-third removed, *ib.*, 387, 408-14. If possible there should be some legislation for the protection of bench-marks, *ib.*, 387-8. Bench-marks should be protected by the necessity of giving notice of removal, *Crook*, 1536-53. In foreign countries bench-marks are put under the local authorities, *Wilson*, 389.

BINNIE, Mr. A. R. (Analysis of his Evidence.)

Is chief engineer to the London County Council, and a member of the council of the Institution of Civil Engineers, 5091.

There should be an adequate staff constantly employed on the revision of London, 5096. Large towns should be revised every 5 or 10 years, mining and manufacturing districts every 10 or 15 years, and purely agricultural districts at much longer periods, 5097.

Thinks it would be a very reasonable requirement to oblige by statute local authorities to send in, yearly, tracings of all alterations on the scale of the Ordnance map, 5096, 5100-1. All plans thus prepared would have to be checked by the Ordnance, 5102. Thinks that this scheme would save the Ordnance three-fourths of their detailed survey work, 5104-6. The department should provide manuscript plans on payment, and publish new editions when practicable, 5107-9.

Explains agreement whereby the Metropolitan Board of Works contributed 10,000*l.* towards the survey of London in 1859, 5109-12. Discussion as to whether the cost of the revision of town plans should be borne by the towns or State, 5113-28. Thinks it reasonable that towns should be asked to pay part of the cost, 5131.

Asks that the large-scale survey of London may be extended to cover a much larger area, 5096, 5134-43. Asks for a map on a 12-foot scale for use in laying out new streets, sewers, &c., 5093, 5144-53. States that his staff have found various errors in bench-marks, 5097.

Complains of there only being 100-foot contours on the new 6-inch map, 5093, 5154-70. Contours at such a large interval are very little good to engineers, 5158.

Complains of the coarseness of the work on the 6-inch photo-zinc maps, 5093, 5171. Complains of the

quality of the paper and asks for a thick drawing paper, 5172-9.

Would just as soon be without trees on the 25-inch and 6-inch maps, 5180-5. Would like lamps and gully-holes inserted on the town plans, but would omit the detail of gardens, 5187 *et seq.*

Objects to coloured impressions; prefers a hatched map, 5202. Thinks one edition of town plans, a black hatched one, would be sufficient, 5201-6.

Thinks the numbering of areas may be useful for rating purposes in the country, but as an engineer would sooner be without them, 5213-7. Prefers areas on the plans to area books, 5220-1.

Thinks parish and other boundaries should be shown on the 1-inch map, 5223-7, 5235. Thinks alterations to boundaries should be shown as soon as possible on plans, 5097.

Nothing could be better than the now engraved 1-inch map; the photo-zinc 1-inch is a very good map, 5229-34.

Likes a combination of contours and hill-shading for representing hills, 5236-40. The present hill-shading makes the maps too black, 5241-3. Does not recommend the use of colour in printing hills, 5244-8. Has no desire for maps printed in colour, 5249.

BOUNDARIES:

1. *General.*
2. *Whether alterations to boundaries should be shown at once on the published plans.*
3. *Whether parish and other boundaries should be shown on the 1-inch map.*

1. *General.*

Suggests that the Department might enter into some arrangement with county councils for the revision of boundaries, as was done with the Scotch Boundary Commission, *Wilson*, 5844-6. The Department decides disputed boundaries from the best authorities obtainable, and advertises them and exhibits them to the public, *ib.*, 475-9, 5848. It would be a very great advantage if English boundaries were in the same settled condition as Scotch and Irish boundaries, *ib.*, 5846-7; *Leach*, 4064-6; *Freshfield*, 4754a.

Has never hesitated to accept the accuracy of the Ordnance boundaries, *Wheler*, 2086, 2366.

2. *Whether alterations to boundaries should be shown at once on the published plans.*

The alterations to boundaries have been very extensive, *Wilson*, 5838. The labour of carrying out alterations on the published plans will be something enormous, *ib.*, 286-91. Suggests that boundaries should not be altered on the published plans till the general revision, but the Department should on demand show new boundaries in colour on existing plans, *ib.*, 5836-7. Boundaries are not important to a very large number of people; would not press for alterations to be shown at once on plans, *Till*, 3360-3. The general public do not care about boundaries; it would be extravagant to show alterations at once on plans, *Leane*, 3791-4.

3. *Whether parish and other boundaries should be shown on the 1-inch map*

Objects to parish boundaries being shown on the 1-inch map, if required they should be on a separate edition, *Chambers*, 3388-91. The general public do not care about boundaries, *Till*, 3360; *Leane*, 3791.

Thinks parish and other boundaries should be shown on the 1-inch map, *Binnie*, 5223-8, 5235.

See AREAS; PROPERTY BOUNDARIES.

BRICKDALE, Mr. C. F. (Analysis of his Evidence.)

Is a practising barrister and conveyancer, and author of works on land registration, 5914.

States that the use of the Ordnance maps for conveyancing purposes is only gradually coming in, the title map still rather holding the field, 5916-20. The numbers of the plots in the Ordnance maps have been used in descriptive schedules, and any change in them will cause trouble in the future, 5925-8.

Gives explanations on the systems of describing properties in deeds, 5929-32, 5937-8, 5957-9. Thinks that the ideal conveyancing is by map, 5960. Describes the system adopted in France, 5940. Constant revision is of the first importance, to make maps popular for conveyancing purposes, maps in growing suburban districts must be revised every year or oftener, 5943-5.

Editions of maps on strong thin paper would be useful for several purposes, 5946 *et seq.* It is not

within the province of any map maker to investigate the boundaries of properties, 5954-6. In the Land Registry Office only the physical features of the boundaries are shown, in accordance with a provision of the Land Transfer Act, 5996-8.

Suggests that the Land Tax Commissioners and Inland Revenue authorities be compelled to use the Ordnance maps for their work, this would advance the use of the Ordnance maps for conveyancing purposes, 5961-5.

States that the Ordnance maps are used almost exclusively in the Land Registry Office, and describes the purposes for which each scale is used, 5971-3. Describes how the extra surveys required by the Land Registry Office are carried out under the supervision of Ordnance surveyors, 5975 *et seq.* Little correction is required in the country, but in growing districts expensive surveying has frequently to be done, 5990-3.

Suggests that it should be a legal obligation on all local authorities to provide themselves with a map on the largest available scale—5 or 10 feet for towns, 25-inch for the country—corrected within three months of date by inserting alterations of roads, &c., 5999-6004, 6017 *et seq.*

Considers that the publication of town plans is a hindrance to their use by conveyancers, and thinks that these plans should be handed over to the local authorities to be revised by them; manuscript plans to be supplied to the public at cost price, 6006-14.

Observations on the system of land registration adopted in the Middlesex and Yorkshire registries, these are the only deed registries in existence where a map does not form an essential part of the system, 6030-4. Describes the system of land registration in Australia, 6035-8.

BROOM, Mr. G. J. COTTON, A.M.I.C.E., F.G.S. (Analysis of his Evidence.)

Is borough surveyor of St. Helens, 4071.

His borough paid the Department for a 10-foot survey of the town in 1882, 4073-8. Since then, to within the last two years, has kept the map filled in, 4081-6. Thinks his work is as correct as that of the Ordnance Department, 4087. Thinks most large towns keep their maps up in the same way, 4090.

Points out a small error he has found in the Ordnance map now being produced, 4087-8; see *Wilson*, p. 222.

Suggests that all town authorities should at least every third year supply the Ordnance Survey with a tracing of all alterations, 4091-5. Does not think the municipalities would object to being obliged by law to do this, 4106-9. The Department should supply, when asked for, a corrected plan in manuscript, 4096-8.

Thinks a revision every 10 years would suffice, 4133-6. If the triangulation were supplied for growing districts outside, the town could easily fill in the map, but would prefer to pay the Survey to do it instead, 4100-4.

Would not care to see any detail except trees in gardens omitted from the plans, 4110-5. Thinks it would be quite sufficient to publish a single edition, hatched, of town plans, and do away with the coloured and uncoloured editions, 4119-30.

A good drawing paper is necessary for plans, 4132. Thinks the 10-foot scale the smallest scale suitable for town plans, 4137-8. Describes a 12-inch map he has lately reduced from the Ordnance 25-inch to show town wards, 4143-54.

C.

CADASTRAL SURVEY:

A cadastral plan is a plan from which the area of land may be computed, and from which its revenue may be valued, *Wilson*, 120-3. The cadastral survey was originally intended mainly for the purposes of land registration and land valuation, *ib.*, 3, 10-14; *Leach*, 3835. As to who benefit most by cadastral plans, *Crook*, 855-8. In England the public, abroad the individual, pays for cadastral work, *ib.*, 854, 859-61.

Cadastral plans are not published abroad, *Wilson*, 94. States that when Parliament voted money for the completion of the cadastral survey, it understood that Yorkshire and Lancashire were included, *Crook*, 775-87; *Wilson*, p. 219.

Extent of cadastral surveys in India, *Walker*, 5381-2, 5397-9, 5410. Cadastral plans are published

in India, but there is very little demand for them, *ib.*, 5427.

See CONVEYANCING; DELAY; FOREIGN MAPS; LAND VALUATION.

CATALOGUE:

1. General.

Considers that the catalogue is badly arranged, *Crook*, 1449. It is a most difficult thing to suggest improvements, *Wyld*, 1979. The catalogue is essential to his business, *Stanford*, 2680.

2. Improvements suggested.

The date of survey of each parish should be inserted, *Stanford*, 2689-91. There should be an index to the 25-inch map by counties, *ib.*, 2684 *et seq.*; *Wyld*, 1979.

CHAMBERS, Mr. G. F. (Analysis of his Evidence.)

Is a barrister residing at Eastbourne, and an officer in the 1st Sussex Engineer Volunteers, 3366.

Thinks that the new 1-inch map does not meet the requirements of tourists, being full of unnecessary detail, 3368, 3413-4. Complains of the way in which roads and footpaths are shown, and says he has found tracks marked as roads which are only footpaths, 3369-87; see *Wilson*, p. 222.

Objects to parish boundaries being shown on the 1-inch map, 3388. If inserted they should be on a separate edition, 3389-92. Thinks the printing of parish names disfigures the map, 3393.

Thinks that the general public understand hill-shading, but not contouring, 3398, 3485. Would like to have contours printed in colour, 3417.

Thinks the 1-inch map is inconveniently crowded with names, 3401. Objects to the names of suburban villas being shown, 3402-11. Criticises the spelling of certain names, 3418-23; see *Wilson*, p. 222.

Raises the question of the right to reproduce Ordnance maps, 3424 *et seq.* Asks for increased facilities for republication of local areas, 3424-36. Provided a map differs in scale or extent, thinks no restrictions as to reproduction should be enforced, 3429, 3433. Thinks that Government should continue the official publication of maps, 3435-40. Sees no objection to their catering for the public taste by producing cheap colour maps, 3502-17. Observations as to whether the Government should charge a royalty for the right to reproduce maps, 3442-50.

Suggests a tourist map on a 2-inch scale, to be in outline, with all roads, tracks, rivers, &c. inserted, 3452-65. Possibly the completion of the 1-inch hill-shaded map may do away with the need for such a map, 3467. The 1-inch maps are too expensive when you are going to cover a large amount of country, 3469-70.

Criticises two experimental maps of the Isle of Wight and Portsmouth, 3473-84. Prefers a map in the style of the *carte vicinale* to our 1-inch map, 3487-95.

Thinks the town surveyor of Eastbourne might easily send every year to the Survey plans showing all alterations to buildings, with a view to revision, 3498-501.

COLOURED IMPRESSIONS:

1. As to high price of coloured impressions.
2. As to difficulty in procuring uncoloured impressions.
3. Whether colouring or cross-hatching is preferable for distinguishing buildings.
4. Whether one distinct hatched plan is sufficient, or whether a skeleton plan is required in addition.

1. As to high price of coloured impressions.

This is largely due to the system of agency, *Wilson*, 5803 *et seq.* The agent's fee should be the same on coloured as on uncoloured maps, *Walker*, 5467.

Cannot sell the very expensive sheets at all, *Stanford*, 2422-3. The price is too high to find purchasers, *Till*, 3332.

How the price of coloured impressions is assessed, *Wilson*, 5814-5. Suggests that the price of all coloured impressions should be averaged, *Stanford*, 2425, 2428-30.

2. As to difficulty of procuring uncoloured impressions.

It is to the advantage of the agent to push the sale of coloured maps, and so he does not keep a stock of uncoloured ones, *Wilson*, 5806-7; *Crook*, 1040; *Walker*, 5467. The agent should keep uncoloured maps, instead of coloured ones, *Crook*, 1048.

3. Whether colouring or cross-hatching is preferable for distinguishing buildings.

Hatched plans have a good sale as compared with coloured ones, *Crook*, 997. Prefers hatching; thinks colouring a useless expense, *Wyld*, 1956 *et seq.* Hatching is much better than colouring, *Cooper*, 3668. Prefers hatched maps to coloured ones, *Ryde*, 4404.

Coloured plans are more attractive and more easily understood by the uneducated public, *Johnston*, 2738. See Appendix XIII.

4. Whether one distinct hatched plan is sufficient, or whether a skeleton plan is required in addition.

Suggests one distinct map, a hatched one, *Crook*, 1004-7, 1042-4. See no objection to having all plans hatched, *Wheler*, 2336 *et seq.*; *Till*, 3336-8; *Fuller*, 4183-9; *Broom*, 4119-30; *Tomes*, 4551; *Binnie*, 5206. A hatched plan is better than a skeleton one, *Morham*, 3082-3.

The President of the Surveyors' Institution says it would be desirable to have an uncoloured map, *Wilson*, 437, 458. A few architects require skeleton maps, but their number is infinitesimal, *Wyld*, 1976. Prefers a skeleton plan to one hatched or coloured, *Murray*, 3145-6. In some cases might prefer an outline map, *Cooper*, 3667. Would be very sorry to see plain maps abolished, *Leane*, 3715-23. Does not want maps hatched or coloured, *Ryde*, 4400.

See CROSS-HATCHING.

COLOUR PRINTING:

1. General.
2. Whether it is desirable to publish maps in colour.
3. How far accuracy of registering can be ensured.
4. Whether contours should be printed in colour.
5. Whether the production of cheap colour maps and maps on small scales should be left to the trade.
6. To what extent private firms should be allowed to reproduce Ordnance maps.

1. General.

The sale of large-scale maps is not sufficient to make colour printing pay, *Wilson*, 437, 5816. Maps abroad are printed in five or seven colours, *Freshfield*, 4773. The military committee had in contemplation a colour map of the whole country, *Wilson*, 5688-90.

2. Whether it is desirable to publish maps in colour.

It is a great advantage to the public to print maps in colour, *Crook*, 1256. Colour printing is of great importance, *Fuller*, 4265. Great advantages of colour printing, *Galton*, 4569. Colour is essential if confusion is to be avoided, *Freshfield*, 4772, 4793. For the general public it may be desirable to have less precision and some printing in colour, *Walker*, 5457, 5467. Would like to see 1-inch map coloured, *Chambers*, 3490; *Merivale*, 5312.

Has no desire for maps printed in colour, *Binnie*, 5249. Does not think colour desirable for 1-inch map, *Stanford*, 2626-7.

3. How far accuracy of registering can be ensured.

Cannot be absolutely sure of accuracy when one printing has to fit another; on this account prefers outline in black, *Bartholomew*, 1725-6. Maps in one colour can be produced much more accurately than those in several colours, *Walker*, 5456, 5458.

Slight defects in registration would not be so serious in the case of contours, *Bartholomew*, 1728-37.

No difficulty in securing accurate registering, does it every day, *Johnston*, 2733.

4. Whether contours should be printed in colour.

Has tried experiments in printing contours in colour, but has not received much encouragement to go on with them, *Wilson*, 531-2. If it were not for the expense would prefer to print contours in colour, *ib.*, 552, 534, 5704-15. Would like contours in colour, *Crook*, 1274 *et seq.*; *Chambers*, 3417; *Wilkinson*, 4580-1; *Freshfield*, 4772; *Williams*, 5626. "Prefer contours in black, *Bartholomew*, 1728-37; *Wheler*, 2198-2203; *Merivale*, 5303-5.

5. Whether the production of cheap colour maps and maps on small scales should be left to the trade.

Quotes memorandum of Sir O. Trevelyan which has always guided the Survey in dealing with this question: "... by placing the maps at the disposal of private publishers materials will be furnished them for the construction of every description of maps suited to the public taste. ...". *Wilson*, 660. Mr. Bartholomew has published a very

good map on a half-inch scale, and other special maps, *ib.*, *ib.*; *Bartholomew*, 1642 *et seq.* Thinks that the production of cheap colour maps should be left to the trade, *Wilson*, 5685-6. Maps on a smaller scale than the 1-inch should be left to the trade, *Bartholomew*, 1784; *Stanford*, 2589; *Johnston*, 2841-51. It is quite sufficient for the Department to publish the town, 25-inch, 6-inch, and 1-inch maps, *Merivale*, 5365-7.

See no objection to the Department catering for the demands of a public who want cheap maps, *Chambers*, 3502-17; *Galton*, 4569; *Walker*, 5377.

6. To what extent private firms should be allowed to reproduce Ordnance maps.

The enforcement of the copyright rests with the Stationery Office, who do not often interfere, *Wilson*, 661 *et seq.* The trade do not always like to reproduce Ordnance maps, as the right of reproduction is reserved, *Stanford*, 2597-601. Asks for increased facilities for the republication of local areas, *Chambers*, 3424 *et seq.* Observations as to whether the Government should charge a royalty for the right to reproduce their maps, *ib.*, 3433-4, 3442-50. It might be arranged for private firms to pay for the right to produce popular maps in cheap form, *Bartholomew*, 1780-2. There should always be a Government department publishing official maps, *Chambers*, 3435-8.

Thinks that an actual reproduction should be objected to, *Wilson*, 661-8. An actual photo-litho reproduction ought to be prohibited, *Bartholomew*, 1686-9, 1785-90.

See *HILLS*.

COMBINED SHEETS :

There is no practical difficulty in producing combined sheets, press of other work has prevented this being done, *Wilson*, 583-5. The issue of combined sheets would increase the sale of maps, *Freshfield*, 4859. It is desirable that combined sheets on the 6-inch and 1-inch scales should be produced for town district; see *Crook*, 1186-92; *Johnston*, 2841; *Till*, 3294; *Fuller*, 4940-1; *Walker*, 5480.

COMPLETION OF SURVEY :

of 25-inch :—

of *England* now completed except for *Yorks* and *Lancashire*, which will be completed about 1895, *Wilson*, 60-1, 70-3; of *Scotland* about one-third is completed, *ib.*, 76-7; will be completed about 1897, *ib.*, 350; of *Ireland* is just started, *ib.*, 79-80; will be completed in about 25 years, *ib.*, 353.

of 6-inch :—

completed for three kingdoms, *ib.*, 69, 74, 78.

of 1-inch outline :—

of *Scotland* and *Ireland* completed, *ib.*, 75, 81; of *England* will be completed by engraving in 1896, and by photo-zincography or engraving this year, *ib.*, 147, 159.

of 1-inch with hills :—

of *Scotland* 29,310 miles published, will be completed in 1893, *ib.*, 75, 5721a; of *Ireland* 29,433 miles published, will be completed in 1894, *ib.*, 82, 5721a; of *England* will be completed by engraving in 1910, and by photo-zincography or engraving by 1900, *ib.*, 161, 218-9.

The output of the 1-inch map has increased enormously since the cadastral survey became available, *ib.*, 186-7; p. 227-8.

CONTOURING :

1. General.

2. Insufficiency of—

(a.) for engineering purposes.

(b.) for giving a representation of the ground.

3. Great utility of contours.

4. Altitudes proposed for additional contours.

5. Cost of contouring.

1. General.

For general description of contouring work, meaning of terms "instrumental contour," &c. see *Wilson*, p. 228.

Contours are now shown in accordance with the recommendations of the Contour Committee, acting on the advice of Brunel and other celebrated engineers of the day, *Wilson*, 556-62. Instrumental contours are distinguished from interpolated contours on the maps, *ib.*, 566-7. Interpolated contours can

be relied on perfectly, *Crook*, 1114, 1128. Complains that contours are dropped near fortified places, *ib.*, 756-61, 1326-31. There are no clearer maps in the world than the contoured maps of Yorkshire and Lancashire, *ib.*, 1168. A considerable number of altitude figures should be put upon the upper side of the contours, *Leach*, 4032. Contours require revision in mining districts, *Merivale*, 5283.

In foreign maps very little contouring is instrumental, it is more of the nature of hachuring, *Crook*, 1118-20. Very little contouring has been done in India, *Walker*, 5443 *et seq.*

2. Insufficiency of—

(a.) for engineering purposes.

The change of contouring from 25 to 100 feet is a very great mistake, *Cooper*, 3542-4. Is strongly of opinion that there are not enough contours to show the ground for engineering purposes, *Leach*, 3997, 4011. For engineering purposes the 100-foot contours might almost be left out, *Binnie*, 5154 *et seq.* Contours 100 feet apart are not enough for mining engineers, *Merivale*, 5276. Also see *Crook*, 1106; *Till*, 3344; *Opinions of Civil Engineers*, p. 229-31.

(b.) for giving a representation of the ground.

Contours were not intended to give a representation of the ground, *Wilson*, 569. The majority of people do not care about contouring, *Stanford*, 2503-4. In moderately undulating country the existing contours give no idea at all of the ground, *Crook*, 754. Regrets the diminution of contours, as in Yorkshire and Lancashire the contours show the features of the ground quite sufficiently, *Wilkinson*, 4574 *et seq.*

The stopping of contours at 1,000 feet from a geographer's point of view is barbarous, *Freshfield*, 4785. The abandoning of contours above 1,000 feet has made geological surveying extremely difficult, *Geikie*, 3023-4.

3. Great utility of contours.

With 25-foot contours an engineer can practically design a reservoir without going on the ground, *Crook*, 1110, 1129-30. Contours are exceedingly valuable for drainage purposes, *ib.*, 1110. Contouring is necessary to ensure accurate hill-sketching, *ib.*, 1123. With 25-foot contours roads can be laid out in the office, *ib.*, 1111. Immense advantage of contours in making catchment basin maps, *ib.*, 1178 *et seq.* With 25-foot contours all the preliminary work in designing railways can be done from the maps; in some cases railways could never have been made without them; quite three-fourths the expense of designing has been saved, *Cooper*, 3545-55. Mr. Vignoles laid out a railway in Kilkenny from the 6-inch contoured map without going on the ground, *Leach*, 4006. Contours are valuable to geologists, *Williams*, 5618b.

4. Altitudes proposed for additional contours.

Instrumental contours at 250 feet from 1,000 feet to the top, and interpolated contours at 25 feet interval from the sea level to the top, *Crook*, 1146 *et seq.* Every 25 feet up to 250 feet, every 50 feet up to 500 feet, every 100 feet up to 1,000 feet, every 250 feet above to the top, a certain number to be instrumental, *Geikie*, 3025-6. 100-foot contours up to the top, *Williams*, 5618, 5626.

50-foot contours in flat districts, *Till*, 3344. 25-foot contours in moderately level country up to 500 feet, part to be instrumental, *Leane*, 3747-54. The vertical intervals should not be fixed, the Department should interpolate contours where necessary to figure flat areas, *Leach*, 3999-4003, 4026-31. The vertical interval should depend on the character of the country, and the purpose for which the map is required; the number of instrumental contours need not be largely increased, *Wilkinson*, 4585, 4595, 4603-8.

25 or 50-foot contours up to 1,000 feet, *Merivale*, 5276-9. 25 feet up to 500 feet, 50 feet up to 1,000 feet, *Walker*, 5467.

For return showing altitudes of existing contours, see Appendix XII.

5. Cost of contouring.

For estimates of cost of additional contours, see *Wilson*, p. 228-9. The cost of contouring has varied from 17s. to 11. per lineal mile, *ib.*, 571. It is extremely difficult to give an accurate estimate of the cost of contouring, *ib.*, 5738.

Also see *Leach*, 4004, 4008-10.

See COLOUR PRINTING; HILLS.

CONTRACT :

Thinks maps would be produced quicker and cheaper by contract, *Bartholomew*, 1830-4.

The Admiralty get their charts engraved by contract, *Wharton*, 4967 *et seq.*

As to contracts for publishing French maps, see *Appendix VIII.*

See PAPER.

CONVENTIONAL SIGNS :

It is difficult to find room for a reference to them on the margin of maps, *Wilson*, 452-7, 579-32. Suggests that they should be shown on parish indexes, *Leach*, 3908. Considers that an explanation of them should be given on the margin of maps, *Crook*, 1078-91; *Merivale*, 5309-11; *Fuller*, 4260-3.

CONVEYANCING AND LAND REGISTRATION :

The 25-inch map was intended for purposes of land registration, *Wilson*, 10-14. The 6-inch map is exceedingly useful for conveyancing purposes, *Lewis*, 4388. The use of the Ordnance maps for conveyancing purposes is coming in but gradually, the tithe map still holds the field, *Brickdale*, 5917 *et seq.*; 5931-2. Suggests compelling the Land Tax Commissioners and Inland Revenue authorities to use the Ordnance maps, *ib.*, 5961. In France it is almost the invariable custom to make conveyances by reference to numbers on the local cadastral maps, *ib.*, 5940.

See LAND REGISTRY OFFICE.

COOPER, Mr. E. (Analysis of his Evidence.)

Is engineer of the Lancashire, Derbyshire, and East Coast Railway, 3518. Has an intimate knowledge of the different Ordnance surveys extending over 25 years, 3522.

Describes how he uses the 1-inch map in preparing railway plans 3523, *et seq.* Finds the contours of very great advantage, 3528. Prefers contouring to hill-shading for his work, 3530. Criticises the hill-shading on the 1-inch map, thinks there is not enough distinction between big and little hills; there is too much attempt to make a picture of it, 3557-66.

Describes the very great utility of the 6-inch maps for railway work, 3535 *et seq.* The maps are so absolutely correct that you are perfectly certain of arriving on the ground at the result come to on the maps, 3537-41.

Reducing the number of contours on the 6-inch map was a very great mistake, 3542-4. States that the use of contoured maps has saved an enormous expenditure in preliminary railway surveys, 3546-55.

Has worked across England from east to west, and found no practical difficulty from the different meridians, 3576-80.

Complains of the want of uniformity in the paper for the 6-inch maps, 3581-6. Wishes for a hard drawing paper, finds the present paper too soft, 3589-91. Does not care for a thin tough paper, 3587.

Discussion as to what trees should be shown, 3592-3610. Isolated trees, woods, and orchards should be shown, nothing else, 3610.

Objects to the size of the 6-inch quarter-sheets, 3568, 3611-5. Thinks the general public, as well as the engineering profession, would prefer whole sheets, 3613.

Would like the position of the 25-inch sheets shown by lines on the margin of the 6-inch maps, 3617-8. A great many engineers use the 25-inch maps for actual construction, 3623-4. The correctness of these maps is wonderful, 3627-9. Thinks the detail of gardens should be omitted from the 25-inch maps, 3619, 3630-1.

Thinks there should be a legal obligation on all public bodies and private individuals to send in notices of alterations, 3632-44. Points out the case of a railway in Lincolnshire stopping in the middle of a field, 3639; see *Wilson*, p. 222.

Would like indexes printed as far as possible on the same sized sheets, 3645. Would like to have a combined index of all scales with the sheet lines shown in different colours, 3647-54.

Thinks that the maps are very cheap, 3655. Criticises the commission allowed the agent, 3655-61.

If hatching could be done lighter would prefer one edition hatched to two, coloured and uncoloured, 3663-76.

German and Italian maps give by no means the same facilities as ours to railway engineers, 3677-88. Considers French maps have too much ornament on them, 3689.

There is no map in the world which can in any way compare with our 6-inch map, 3690. The 1-inch map is superior to any similar scale of map he has ever seen, 3691.

It would be the greatest mistake to introduce any more scales, 3694-5.

COPYRIGHT :

See COLOUR PRINTING, Sub-head 6.

COST OF SURVEY :

Statement of sums voted for the Survey from 1858-92, *Wilson*, 27. Distribution of expenditure from 1831-92, Appendix XIV. The sum of 1,135*l.* was granted by the Treasury for the advanced edition of the 1-inch map, *Wilson*, 374-7. As to cost of the Indian Survey, *Walker*, 5388.

As to difference in cost between surveying and publishing towns on the 1/500 and 1/2500 scales, see *Wilson*, 5779-92, Appendices VII. and XV.

See PRICES OF MAPS.

CROOK, Mr. H. T., Civil Engineer. (Analysis of his Evidence.)

Criticises the statement he understood Sir C. Wilson to have made that a trifling expense would have given an independent 1-inch map, 20 or 30 years ago, 699-707, 740; see *Wilson*, p. 218. Criticises the annual reports, 708. Charges the Directors of the Survey with having made changes in the system of numbering 1-inch sheets which have tended to mislead the public, and that they have taken credit in the annual reports for doing work they have not done, 709-20; see *Wilson*, p. 218. Complains that it is only lately that the date of survey has been put on the maps, 721-6. Complains that the original idea with which the Survey was started, a hill-shaded topographical map of Great Britain and Ireland, is not yet completed, 733-9. Fears the Treasury may stop the production of the engraved 1-inch map, 743; see *Wilson*, p. 218. Gives his interpretation of the meaning of the term "topographical," 744-52.

Complains that contours are dropped near a fortified place, 756-61, 1326-31. Draws attention to Sir H. James's estimate of 1862, that the cadastral survey could be completed in 21 years for an annual grant of 30,000*l.*, 766-8; see *Wilson*, p. 218. The rapid publication of the *carte vicinale* of France is compared with the slow production of our 1-inch map, 769; see *Wilson*, p. 219. States that when the House of Commons voted a sum of money for the completion of the cadastral survey by 1890 they understood that Lancashire and Yorkshire and the Scotch counties on the 6-inch scale were included, and that Mr. Shaw Lefevre so understood it, 775-87; see *Wilson*, p. 219. States that the 1/2500 survey of Ireland is being made without being brought before Parliament, 788-91; see *Wilson*, p. 219. There is practically no revision work going on now, it is all re-survey, 791-5. States that a difficulty exists in obtaining 6-inch quarter sheets contoured, 801-5; see *Wilson*, p. 219.

Suggests why the sale of outline maps is very much larger than that of hill-shaded maps, 805-12. Thinks there is nothing in the world like the hill features in the Scotch maps, 809. Compares the relative uses of hill-shaded and contoured maps, 813-9. Compares the topographical maps produced abroad with our 1-inch map, 820-3. Thinks that cadastral work should be separated from topographical work, 800, 829. Discusses the difficulty in obtaining bill engravers, 831-44; see *Wilson*, p. 219. Foreign nations do not publish their cadastral plans as a rule, 846. Draws attention to a statement by Sir C. Wilson as to the sale of maps, 848-52; see *Wilson*, p. 219. What class of people benefit most by the cadastral survey, 855-8. In England the public, abroad the individual, pays for cadastral work, 854, 859-61.

General observations as to the extent of 1/500 surveys for towns, 863-916; see *Wilson*, p. 219. Complains of the way in which the Department interprets the Treasury order for the survey of towns, and instances the case of Manchester, 863-95. The Department refuse to add to their survey unless the towns concerned defray the expense, 896. Does not consider the 25-inch scale large enough for the fringe of great towns, 897, 908-10. Thinks that the State should not pay for all town plans, 897-8. Remarks on great difference between cost of 1/500 and 1/2500 surveys; thinks it is only a matter of a little extra detail, 900-5; see *Wilson*, p. 220. Remarks that the Depart-

ment benefits by making surveys out of turn at the expense of the towns, 912; *see Wilson*, p. 220.

The majority of towns keep up their plans very badly, 917-9. Does not think the scheme whereby local surveyors should send tracings of alterations to the Survey Department practicable, 920-6. Propounds a scheme for the revision of town plans, 927 *et seq.*; *see App. XI*. Criticises the present location of the Survey Divisions, 928-37; *see Wilson*, p. 220. New surveys of all alterations must be made by the Ordnance Office, 948-50. It would be no assistance to have plans sent to test, 952. Towns should be compelled to pay the Ordnance Survey to keep up their plans for them, 953 *et seq.* This expense would be defrayed by the town paying the Survey the money they now spend imperfectly on a similar process, 967. Suggests that there should be revision centres in the large towns, 979-87; *see Wilson*, p. 220. States that the Survey in Lancashire is covered with mistakes, 979-83; *see Wilson*, p. 220.

Thinks the new town maps are good enough for anyone, 993. There is a good sale for hatched maps as compared to coloured ones, 997. Suggests instead of coloured and uncoloured impressions, a hatched map be issued, with the hatching not too heavy, 1005-9. Thinks there is one town in Yorkshire half hatched, half coloured, 1011; *see Wilson*, p. 220.

Discusses how far the work of borough surveyors may be accepted by the Survey, provided that it is subsequently examined by them, 1014-5, 1018-23. An instance is given where a corrected plan offered by a borough surveyor was refused by the Survey, 1018; *see Wilson*, p. 220. Draws an unfavourable comparison between the price paid for extra surveys at Bury and Manchester, 1016-7, 1026; *see Wilson*, p. 220. A competent survey staff in every town would seem a more costly operation than the Ordnance Survey doing the work, 1028. Considers that town plans should be continuously corrected, 1029. It takes much less time and money to do the revision year by year than to do it every 40 years, 1032. Draws attention to an apparent error in a plan of Manchester, 1036-9; *see Wilson*, p. 220.

Complains that the agent does not keep uncoloured impressions, and consequently there is two or three days' delay in getting them, 1040. Discusses the advantages of hatched over coloured plans, 1042-55. Hatching should be lighter, 1045-6. Would not object to all plans being issued hatched, 1053.

Complains of want of uniformity in the Ordnance system, 1054; *see Wilson*, p. 220. Complains of delay in publishing the 25-inch maps of Eccles and certain other parishes, 1056-73; *see Wilson*, p. 220. States that the new sheets of Worsley have been filled up with the old survey of Eccles, 1074-5; *see Wilson*, p. 220. Asks that a key to the conventional signs should be given on plans, 1078-91.

The errors on large-scale maps are not more than are due to human infallibility in all things, they are exceedingly rare, 1092-3.

The public do not understand the necessities of the photo-zinco process, and wonder at the change in style from engraving to photo-zincography, 1094. Complains of the quality of the paper used for 6-inch photo-zinco maps, 1096. Complains of the price of these maps, 1098-1103. As the sale does not repay total cost of production does not see why Treasury should contribute more for the engraved map than for the photo-zinco one, 1101-2. As regards size, thinks a single quarter-sheet is rarely required, 1105.

Thinks the greatest defect of the new 6-inch map is the reduction in the number of the contours, 1106. Describes the very great utility of contours to engineers, 1110-1, 1122, 1129, 1178-85. Advocates a return to the style of 1845 as regards interpolated contours, 1116. Considers these perfectly reliable, 1114. Compares our contouring with what is done abroad, 1118-20. States that on some maps the hill-shading and contouring is inconsistent 1123; *see Wilson*, p. 220. Contours are necessary to ensure accurate hill-shading, 1123. Thinks it was professional jealousy that caused Brunel and other engineers to say that contours were not wanted, 1125-6. Thinks that if contoured maps of Derbyshire had existed, Manchester would have been able to find a reservoir for water there, instead of going to Thirlmere, 1130-3. Contours are also useful for geologists and for reproduction on small-scale maps, 1139. Proposes that there should be instrumental contours at every 250 feet above 1,000 feet up to the top,

1148. With intermediate interpolated contours at every 25 feet, never changing the vertical interval, 1149. Understands that a large portion of the coast has been surveyed for the War Office with contours at 5-feet intervals, thinks this work should be available for the public, 1169-77; *see Wilson*, p. 220. There is no clearer map in the world than the 6-inch of Yorkshire and Lancashire, 1168.

Combined sheets of towns should be published on the 6-inch as well as on the 1-inch scale, 1186-92.

Complains that nearly the whole of the 6-inch maps terminate at present at the county boundaries, each county being plotted on a different meridian, 1192. States that it is utterly impossible to combine the sheets of counties drawn on different meridians, *ib.* Observations on the great number of meridians for the 6-inch maps, 1195-1211; *see Wilson*, p. 220.

Complains that the old survey of Torquay has not been revised, 1212 *et seq.*; *see Wilson*, p. 220. Asks for greater definiteness of description as to date of survey, 1218-9. Suggests that the 6-inch indexes of towns be published as skeleton maps, 1219-24.

Criticises style of advanced edition of 1-inch map, and contrasts it with foreign maps, 1226-40. States that nearly all continental maps are drawn in manuscript on the same scale as that they are published on, 1234. States that the old hill-engraved map is entirely obsolete and at the present moment there is no really good map of the greater portion of the kingdom, 1241. States that many of the new series plates are much worn and should be re-engraved, 1246-7. Criticises the 1-inch new series outline map, 1248 *et seq.* Thinks the introduction of colour-printing would be a great advantage, 1256-8. Does not think the classification of roads is sufficiently distinct, 1259-62. Complains that the number of contours on the 1-inch map is inadequate to give a proper rendering of the ground, 1270. Draws attention to the colours used in the French vicinal map, which he thinks one of the most beautiful maps he has seen, 1271-2. Would like to see contours printed in colour, 1274-7. Remarks as to whether both outline, contoured, and hill-shaded editions of the 1-inch map should be published, 1278-1311.

A distinction should be made on the 1-inch map between double and single railway lines, 1314. Complains of changes in the symbols for footpaths, 1316-8; *see Wilson*, p. 220. Describes and praises the new German military map on the 1/25,000 scale, 1319-23. Asks for information as to foreign processes for producing maps, 1328, 1324; *see Wilson*, p. 220. Compares the amount of detail in England and foreign countries, 1325; *see Wilson*, p. 220. States that the woods are not so clear in the new as in the old 1-inch map, 1334. Thinks there are enough names on the new 1-inch, 1337-8. Asks that small detached portions be shown in the margin of maps, so as to avoid the necessity of buying another sheet, 1340-1. Observations on the method of production, the rate of production, and the revision of the *carte vicinale*, 1347-61.

Complains of want of uniformity in certain 6-inch sheets of the town of Gloucester, 1371-82; *see Wilson*, p. 221. Complains of the style of showing contours on new 6-inch photo-zinco sheets of Yorkshire and Lancashire, 1382-6; *see Wilson*, p. 221. Complains of changes of style in the 1-inch map, 1395-6. Criticises the 4-mile maps of England, Ireland, and Scotland, 1400-43; *see Wilson*, p. 221. Points out certain errors in the 4-mile map of England, and in the 10-mile map, 1417, 1420, 1445; *see Wilson*, p. 221. States that the drawing is incorrect, 1425; *see Wilson*, p. 221. Criticises the style of the Scotch sheets, 1433; *see Wilson*, p. 221. Thinks that the 4-mile map would have been published even if the Societies had not asked for it, 1440-3; *see Wilson*, p. 221. Criticises the 10-mile map of England, 1443-8; *see Wilson*, p. 221.

The catalogue is very difficult for the public to understand, 1449. States that the index map of the coast of Lancashire is incorrectly drawn, 1450 *et seq.*; *see Wilson*, p. 221. States that the index to the parish maps of Lancashire is wrong, and complains that the parish of Eccles is not shown, 1465-8; *see Wilson*, p. 221. Complains that the names of ecclesiastical parishes are used on the maps, and of civil on the indexes, 1472-4.

Asks for three separate indexes for each county, one for the 25-inch, one for the 6-inch, and one for the 1-inch maps, 1479-84. Thinks that the issue of the indexes should precede the publication of the maps, 1489. Points out that the Survey does not

publish any diagrams showing the state of publication, and that that work is left to the agent, 1489-94.

Discusses the question of the supply of paper, 1495 *et seq.* Suggests that the outline edition of the 1-inch map should be printed on thick paper, and the hill-shaded map on a thin good printing paper, 1521. Would not propose to alter the paper for the larger scales, 1527.

Thinks that levels are not distributed with quite sufficient regard to form of ground, 1532-5. But it is seldom this happens, 1533. Makes suggestions for the legal protection of bench-marks, 1536-53. Thinks notice of removal should be required, 1543-53.

Contrasts price of our 1-inch map with that of French maps, 1554. Also with the 1-inch of Scotland, 1555. Thinks that the names of two places on sheet No. 71, Lancashire are wrong, 1557, 1560; *see Wilson*, p. 221.

Discusses the question of how the Survey maps can be made more accessible to the public, 1565 *et seq.* Thinks that indexes should be supplied to all public libraries, 1570-3. Thinks that 125 local agents would be ample, 1578.

Objects to certain paragraphs in the annual report, 1581-3. Asks that it should contain more information and be made more interesting, 1584-5; *see Wilson*, p. 221.

CROSS-HATCHING:

Cost of, *see* Appendix XVI.

As to difficulty of making the present cross-hatching finer, *Johnston*, Major, 4559-65. Cross-hatching makes the work on the map coarser, *ib.*, *ib.*

How far the existing cross-hatching is satisfactory.

It is too heavy, *Crook*, 1008, 1045; *Allison*, 4289. It should be lighter, *Wheler*, 2347; *Murray*, 3148-9; *Cooper*, 3674-5.

It is quite satisfactory, *Till*, 3339.

See COLOURED IMPRESSIONS.

CURRIE, Mr. T., Manager to Messrs. W. and A. K. Johnston. (Analysis of his Evidence.)

Discusses the comparative merits of litho and zinc work, 2855-62, 2866-70, 2894-903. Considers litho work the better of the two, 2856. Thinks that the originals of the maps should be kept on zinc and transfers taken for printing from stone, 2859 *et seq.*

Paper is used dry for all their best work, 2863-5. Considers the paper used by the Survey unnecessarily good, because the great majority of the sheets are used indoors, 2871-2. In all drawing papers an amount of size is necessarily introduced into the pulp of the paper which makes it difficult to print on them, 2875. Describes the difficulty in joining sheets printed from copper and zinc, when mounting them, 2876-9. Has no difficulty in obtaining the same quality of paper year by year, 2880-5.

D.

DATES:

Reason why the date of publication is now put on all maps, *Leach*, 3876-8. The dates of survey and re-survey, and the date of printing, should be put on maps, as is done abroad, *Freshfield*, 4834-5. The dates up to which the fieldwork of each sheet is completed should be given on the maps, *Walker*, 5467, 5480; *Crook*, 721-6.

Asks for greater definiteness of description as to date of survey, *ib.*, 1218-9.

See INDEXES.

DELAY:

The enormous number of town plans has delayed the completion of the rest of the cadastral work, *Wilson*, 165-7, 177, 181-4.

Causes of the delay in completing the 1-inch map.

By Treasury letter of 4th July 1872 the 1-inch map was to be based on the cadastral survey, so the Department has had to wait until cadastral survey was finished to engrave the 1-inch in outline, and then to wait till 1-inch map was engraved before the engraving of the hills could be commenced, *Wilson*, 16, 24, 93, 116. The 1-inch map cannot be produced till four or five years after the completion of the cadastral survey, *ib.*, 251-6.

See ENGRAVERS.

DEPTHS OF LAKES:

See SOUNDINGS.

DETAIL:

1. General.
2. As to what detail should be shown in town plans.
3. Whether trees should be shown.

1. General.

The general public probably find more detail than they require on the 1-inch map, but this would not justify the adapting of the map for bad readers by omitting detail of service to good readers, *Walker*, 5480. Considers it an improvement to omit some detail in town maps, *Bartholomew*, 1630-2. The centre of boreholes and shafts should be shown on the 25-inch plans, *Merivale*, 5260.

2. As to what detail should be shown in town plans.

The detail of gardens should be omitted, *Wheler*, 2169-75; *Morham*, 3108; *Till*, 3252; *Cooper*, 3619; *Leane*, 3756; *Leach*, 3927; *Allison*, 4367; *Tomes*, 4545; *Binnie*, 5187. Also all temporary structures in courts and alleys, *Leane*, 3756.

Would retain refuges and lines of pavement, but would omit lamp-posts, letter-boxes, ventilators, and detail of public buildings, *Murray*, 3153-65.

Would omit lamp-posts but retain ventilators, *Till*, 3245 *et seq.* Lamps and gully holes are an advantage on the map, *Binnie*, 5187 *et seq.* Would omit no detail except trees in gardens, *Broom*, 4111-5. Complains that the details of railway arches and underground streams are not shown, *Allison*, 4352 *et seq.*

3. Whether trees should be shown.

Rules of Department as to inserting trees, *Wilson*, 423-9.

Would omit all trees except isolated and conspicuous trees, orchards, and woods, *Wheler*, 2135-60; *Cooper*, 3592-3610; *Leane*, 3762.

The principal trees should be correctly delineated on plan, *Allison*, 4370. Would show isolated trees, but would not attempt to plot them, *Ryde*, 4434-5. All trees should be omitted from mining maps, *Merivale*, 5254, 5257.

As a broad general view would mark trees as they show the character of the country, *Leach*, 3927 *et seq.* Would omit trees in towns and villages, *ib.*, *ib.*

See Appendix XIII.

E.

ENGRAVERS:

It is extremely difficult to get men to engrave hills, *Wilson*, 193, 198-9, 220, 248.

If engravers were offered regular employment there ought to be no difficulty in getting a sufficient staff, *Crook*, 831 *et seq.* Has considerable difficulty in getting engravers, *Bartholomew*, 1692-5, 1893-8.

ENGRAVING:

Engraving is dying out as an art, *Wilson*, 249. Engraving is about three times as costly as lithographic work, *Bartholomew*, 1847. There has been a general falling off in all engraved work during the last 40 years, *ib.*, 1860-6; *Wyld*, 2045. The only engraved map in India is the $\frac{1}{4}$ -inch map, it is largely done by native engravers, *Walker*, 5390-2.

Opinions as to the engraving of the new 1-inch map.

Scarcely any improvement to be desired; it is better than the old 1-inch, *Bartholomew*, 1855-8. The engraving is fairly good, a few failures here and there, *Wyld*, 2045-6. Is satisfied with the engraving of the new outline and hill sheets, *Stanford*, 2612-9. The engraving of roads and railways is unnecessarily heavy, *Geikie*, 3039. As a rule the 1-inch maps are exquisitely drawn and engraved, *Walker*, 5467.

ERRORS:

1. General.
2. Alleged errors in drawing.
3. Alleged errors and omissions in names.

1. General.

In most cases alleged errors are not errors at all, or are matters of opinion; the errors actually discovered are for the most part draughtsmen's or engraver's errors similar to misprints in books; the Department is always glad to have errors brought to

their notice, and correct them at once, *Wilson*, p. 218. Has found one important and some smaller errors in boundaries, *Wheler*, 2303. Complains that some of the local topography in the Highlands is slightly erroneous, *Geikie*, 3038. Thinks that the levels of bench-marks in London are not as accurate as they should be, *Binnie*, 5097; *Wilson*, p. 222. Complains that certain disused iron and lead works are described as slate works, *Williams*, 5600. Complains that many streams and rocks are not marked, and others are not accurately mapped, *ib.*, 5635-6. Generally speaking, the streams are properly shown, *ib.*, 5637.

2. Alleged errors in drawing.

See *Crook* 1036-9; 1416 et seq.; *Wylde*, 1919-23; *Broom*, 4087.

3. Alleged errors and omissions in names.

See *Crook*, 979, 982, 1557, 1560; *Wheler*, 2246 et seq.

See NAMES.

EVANS, Mr. J., Gwenogfryn. (Analysis of his Evidence.)

Is a student of old Welsh manuscripts, and an honorary M.A. of Oxford, 5502.

Gives a general explanation on Welsh grammar, 5505-7. In his remarks refers to the 6-inch and 1-inch maps, specially of South Wales, but as far as he has examined the maps of North Wales they are equally at fault, 5507, 5508a. Points out the principal causes of the defects in the spelling of Welsh names, 5507. Makes various recommendations for improving this spelling, 5508a et seq.

Complains of the selection of names, that historical sites are omitted, and the names of small villas inserted, 5508a. Complains of the absence of names to brooks, and that they are not clearly engraved, 5513-20.

Suggests that one man be selected and made responsible for collecting all Welsh names, correcting the engraver's work, &c., and that his name should be inserted on the maps, 5520 et seq. Various remarks and explanations on the spelling of Welsh names, exemplified by errors pointed out in the 1-inch map of Glamorgan, 5528 et seq. States he has found 50 errors in this sheet, 5571.

F.

FOOTPATHS:

Complaints are made that mere temporary tracks are shown as footpaths, *Chambers*, 3376, 3380-1. *Ryde*, 4480-93. The Ordnance surveyors are instructed to put in only permanent paths, *Wilson*, 449.

Prior to 1886 footpaths were shown on the 1-inch map by double dotted lines, since then they have been shown by a single dotted line, *Wilson*, 5910. Suggests that the dots be put further apart, *Ryde*, 4494.

See RIGHT OF WAY.

FOREIGN MAPS:

Foreign cadastral maps are not published, but kept in manuscript, copies are obtainable on payment, *Wilson*, 101, 107-10; *Crook*, 846. Comparison of detail shown in English and foreign maps, *Crook*, 1325. About half the foreign maps are printed from stone and half from copper, *Johnston*, 2940.

Description of various foreign topographical maps, *Johnston*, Major, 3208-14. Of various foreign cadastral maps, *ib.*, 3214 et seq. Of French staff map of Algeria, *Wilkinson*, 4629; *Freshfield*, 4777. Of German map on 1/25,000 scale, *Crook*, 1319-23. Of Norwegian map, 1/100,000, *Walker*, 5466.

General comparison of foreign maps with those of the Ordnance Survey.

As to execution ours are almost as good as any of the foreign ones, *Bartholomew*, 1819-25. Our maps are better than foreign ones, *Geikie*, 3051. There is no foreign cadastral survey to be compared with ours, *ib.*, 3052. Objects to foreign maps for having too much ornament; they do not give anything like the same facilities to engineers, *Cooper*, 3677 et seq. The maps of the Ordnance Survey compare well with, and are generally much superior to, foreign maps, *Walker*, 5377.

Also see *Crook*, 820-8; *Johnston*, 2828-40; *Wilkinson*, 4669-76.

See Appendix VIII.; COLOUR PRINTING; FOREIGN SURVEYS; FRENCH VICINAL MAP; PRICES OF MAPS; ROADS.

FOREIGN SURVEYS:

Explanation of difference between foreign methods and our own; with us there is one department carrying on the triangulation, the cadastral survey, and the topographical survey, abroad these are carried out by three separate departments, *Wilson*, 93, 102-6; 126-33. The great difference between our system and foreign systems is that the *cadastre* in all foreign countries is made locally, and has the defects of our old tithe maps, *ib.*, 93. The Ordnance Survey has been hampered by the production of cadastral plans, mainly for private purposes; foreign surveyors concentrate their efforts on the production of topographical maps, *Freshfield*, 4754a.

Comparison of speed of working abroad with what is done in our own country, *ib.*, 4755 et seq. Nearly all continental maps are drawn in manuscript on the scale on which they are published, *Crook*, 1234.

See FOREIGN MAPS.

FOUR-MILE MAP:

History of publication of, *Wilson*, 670 et seq. It was completed for the use of the Geological Survey, *ib.*, 671, 674. As a general geological map of the country does not desire anything better, *Geikie*, 3039.

For general criticism on, see *Crook*, 1398 et seq.; *Freshfield*, 4837 et seq.; *Stanford*, 2671. The map should be condemned and a new one made, *Crook*, 1438.

As a reduction from the old 1-inch it is exceedingly well done, it could easily be brought up to date, *Geikie*, 3039-40. It is a well executed map as far as it goes, *Walker*, 5377-9. Does not see anything the matter with the style of it, *Freshfield*, 4844.

It is desirable that the Ordnance Survey should publish a map on this scale, *Leach*, 4058. The production of such a map should be left to the trade, *Stanford*, 2678.

If the map were completed with the hill features it would be very useful to the general public, *Walker*, 5377-9. The 4-mile map of Ireland has been found very useful, *Wilson*, 685.

See Appendices III. and IV.

FRENCH VICINAL MAP:

Comparison of rate of production of with that of our 1-inch map, *Crook*, 769, 1348 et seq.; *Freshfield*, 4755, 4848 et seq.

It is one of the most beautiful maps ever published, *Crook*, 1271-2. It is a very pretty map, *Johnston*, 2840. Would prefer a map in the style of the *carte vicinal* to our own 1-inch, *Chambers*, 3487-95.

It is not preferable to our 1-inch map, *Stanford*, 2625, 2628-38. It is not at all a distinct or satisfactory map, *Johnston*, Major, 3209. It is not so clear or artistic and not more useful, *Leach*, 4038-9.

See ROADS.

FRESHFIELD, Mr. D. W. (Analysis of his Evidence.)

Has been for 11 years one of the honorary secretaries of the Royal Geographical Society, and for 30 years has had to deal with many foreign surveys, 4753.

Hands in a copy of the resolutions of the Council of the Royal Geographical Society forwarded to the President of the Board of Agriculture, June 10th, 1891, 4754a.

Points out that the Ordnance Survey has been much hampered by the production of a quantity of large-scale plans mainly for private purposes, while foreign surveyors concentrate their efforts on scales not exceeding 1/25,000, *ib.*, 4849. The rate of production of maps abroad contrasts very favourably with what we have done, 4755-62, 4848. Thinks that if the Ordnance Survey had enough money granted, they could work as quickly as any other nation, 4764.

Considers the two great and immediate requirements of our Ordnance maps are the rapid completion of the 1-inch map, and a system of constant revision, 4755.

Compares Dufour's Swiss map with our hill-shaded map, 4767 et seq. Thinks the hachures on our map are much too conventional, *ib.* Advocates very strongly a method of colour-printing which should exhibit both contours and hill features, 4772. Describes what the French and Swiss Governments are doing in this respect, 4773 et seq. Foreign nations are nearly all endeavouring to combine contouring and hill relief by hachuring or shading, 4781-2. Thinks

that in this direction will be found the scientific map of the future, 4776. Would like to see our hills printed in colour with black contours over, 4787, 4790. Colour is essential if confusion is to be avoided, 4792-3.

Asks that contours should be continued right up to the tops of the hills, 4763, 4784-5.

Complains that the different classes of roads are not sufficiently distinguished, 4795 *et seq.* Points out that the French and Italians have four or five different ways of distinguishing roads, 4795. Thinks we should show four classes of roads including the foot-path, 4801 *et seq.* Would show the cart road by a broken line on one side, 4800.

Suggests that an edition of the 1-inch maps be published on thin tough paper, and sold folded up in cases, like the *carte vicinale* in France, 4809.

Would like to see provincial agencies established in all towns where there are a certain number of inhabitants, 4810. And thinks it would be a good plan if maps were exhibited at the post offices, 4811-2. Explains the French system of selling maps, 4813 *et seq.*

Would like to see the soundings of lakes and round the coasts shown, 4827.

Thinks that more care should be taken in the selection of names for the 1-inch map, 4828-9. Considers that it would be possible to get local people to look over the proofs of maps before publication, 4830-3.

Asks that the dates of survey, re-survey, and printing, be shown on all the maps, 4834-5.

Observations on the publication of the 4-mile map, 4838 *et seq.*

Suggests the issuing of combined maps of special districts, 4859. Thinks the advisability of a 2-inch scale should be considered, *ib.* Points out that English altitudes are referred to mean tide level, the Irish to low-water mark, *ib.*

FULLER, Mr. H. H. (Analysis of his Evidence.)

Is a land agent and surveyor, 4155.

Complains of want of uniformity in the 6-inch and 1-inch paper, 4159-63. Maps on thin tough paper would be very useful for attaching to deeds, and would meet all his requirements, 4164-77.

Thinks the maps are very cheap, but that by reducing their prices the Department would largely increase the sales, 4179-82, 4197. Thinks that the want of revision has caused the falling off in the sale of maps, 4199.

Thinks a single hatched edition of the 6-inch and 25-inch maps would meet all the demands of the public, 4183-9.

Complains of the difficulty in dealing with a large number of separate parish indexes, and suggests that the 1-inch map with sheet lines on it be supplied as an index, 4199-4222. Complains of faulty impressions, instancing Essex, 4222-4.

There should be a legal obligation on town and county surveyors to send their surveys to Southampton to form the basis of information for revision, 4225. Thinks that borough surveyors keep up their town maps, and that their work is accurate, 4227-8. A slight examination of their plans by the Ordnance Department would be sufficient, 4229-31. Railway companies and other public bodies should be compelled to send in plans of new works, when they alter the face of the country, 4236. Thinks it would be a great mistake to carry decentralisation by revision centres too far, 4237 *et seq.* New plans should be published every five years for towns, and every 10 years for the country, 4243-8.

Thinks a good many people may like to buy the un-contoured edition of the 6-inch map, 4250-9. A key to a certain number of conventional signs should be printed on the margins of maps, 4260-3.

It is of great importance that areas should be stamped on the plans, 4263-4. Does not think area books are required as well as areas on the plans, 4265.

Considers colour printing of great importance, 4265. Prefers hills to be printed in brown, 4272-6.

Complains that he cannot get maps quick enough, suggests more agencies, and the sale of maps by the Post Office, 4278-83.

The 25-inch map when revised up to date is everything that can be desired for the assessment of agricultural properties, but no amount of revision that is practicable could make the town plans sufficiently up to date for the assessment of urban and suburban properties, 4861, 4864-6, 4881. Gives reasons and explanations for this, 4861 *et seq.* Considers the 10-foot scale preferable to the 5-foot, 4876.

As regards the numbering of areas, thinks that if the numbers are to be altered it would be best to omit them, and leave the overseers to insert their own, 4890-9. It would be a distinct advantage to refer rate-books to the cadastral maps; this could be done readily in agricultural districts; in towns it would involve the overseers correcting the maps themselves, 4906-18. Thinks there would be no difficulty in filing copies of successive editions of the Ordnance maps in public offices for reference, 4919-20.

In his experience, the inaccuracies in the Ordnance sheets are infinitesimal, 4880. Observations on the accuracy of areas computed from town plans, 4927-38.

It would be an advantage often to have combined sheets of towns, 4940-1.

G.

GALTON, Mr. F. (Analysis of his written Evidence, being part of an address delivered before the British Association in 1872.)

Regrets that the Ordnance maps are so little known, and so the public are driven to buy the common and inferior maps which are in the market. The two chief reasons for the small sale of maps are, that the maps are all printed on thick paper, which makes them very cumbersome to carry about, and that the agents being themselves map makers do not care to push the sale. Suggests that maps should be issued in quarter-sheets on thin paper, folded, with an index map on the outside, and that they should be sold at 700 of the principal post offices. Gives a review of the art of colour printing, and points out its many advantages. Suggests that the Government should produce an accurate route map on a scale of about 5 miles to an inch, printed in colour, with hills, 4569.

GEIKIE, Sir A., Director of the Geological Survey of the United Kingdom. (Analysis of his Evidence.)

The work of the Geological Survey is based on the Ordnance maps, 3007. No one has put them to severer tests, and so he can speak with confidence of their extreme accuracy and beauty, *ib.*, 3023. Can hardly conceive of a survey more technically perfect than ours, 3023.

Describes the processes of the Geological Survey, 3007 *et seq.*, 3041-8. States the progress made in England, Scotland, and Ireland, 3010-4. All the colouring of the maps is done by hand, as the results of colour printing were not satisfactory, 3015-8, 3023. States the cost of this, 3020-2.

Deprecates the abandoning of contouring in the Highlands, 3023. This makes geological surveying extremely difficult, 3024. Suggests that certain additional contours be added to the 6-inch map, 3025-6.

Asks that greater attention be paid to the rendering of cliffs, reefs, &c. on the 6-inch map, 3027-34.

Calls attention to the spelling of Celtic names, 3034. Thinks in certain cases it is desirable to add the phonetic to the actual Celtic spelling, 3035-7.

Draws attention to small errors in topography more especially in the remote portions of the Highlands, 3038.

In the Highlands has had to give up using the hill-shaded map as being too black for geological purposes, 3039. The contoured 1-inch map is excellent for this, *ib.* Suggests certain additional contours for this map, *ib.* Thinks the engraving of roads and railways is unnecessarily heavy, *ib.*

Gives his opinion on the 4-mile map, *ib.* As a reduction from the old 1-inch it is exceedingly well done, and as a general geological map he does not desire anything better, *ib.*

Is quite satisfied with the existing indexes, 3040. Thinks our maps are better than foreign ones, 3051. There is no foreign cadastral survey to be compared with ours, 3052.

GEOLOGICAL SURVEY:

General account of the Geological Survey and how the Ordnance maps are used for it, *Geikie*, 3007 *et seq.* Progress of, *ib.*, 3010-4. As to the method of colouring employed and the price of same, *ib.*, 3016-22.

See FOUR-MILE MAP; HILL-SHADED MAP.

H.

HELIOGRAVURE:

See HILLS, sub-head 5.

HILLS, REPRESENTATION OF:

1. *Hill-shaded map.*
 2. *Various systems of representing hills.*
 3. *Whether the hill features should be printed in colour.*
 4. *As to the relative advantages of contouring and hill-shading as a means of representing ground.*
 5. *Whether the heliogravure process could be adopted with advantage.*
1. *Hill-shaded map.*
For full particulars why line engraving has been adhered to in the production of this map, see *Wilson*, p. 225.
As far as the hill features of Scotland are concerned there is nothing like them in the world, *Crook*, 809. Dufour's Swiss map is the only hill map superior to ours, *Wilson*, 5720; *Wilkinson*, 4610.
Complains of the patchwork character of the hill-shaded maps of Scotland, *Johnston*, 2821. Thinks that too much attempt is made to make hill-shading a picture, *Cooper*, 3557 *et seq.* The hachures are much too conventional, *Freshfield*, 4767.
In high ground the hill shading obliterates the lettering, *Bartholomew*, 1704. Hills are so black that the public buy contour maps for the sake of clearness, *Johnston*, 2818-20. Prefers contour maps because hill-shaded maps are so confused, *Wheler*, 2309 *et seq.* Hill-shading in highlands is so black that those maps are not now used for geological purposes, *Geikie*, 3039.
 2. *Various systems of representing hills.*
For full explanation of the various systems, see *Wilson*, p. 226. Explanation on the general principles of representing hills, *Wilkinson*, 4610. The hill features of the 4-mile map of Ireland are produced by triotint, *Wilson*, 692.
Describes system of working up depth of colour with air brush and printing from stone, *Johnston*, 2822-7. States systems adopted in India, *Walker*, 5430-1.
Suggests showing hills by tinting between the contours, *Bartholomew*, 1715-20. Describes system of tinting between contours used in French staff map of Algeria, *Wilkinson*, 4629-32. All foreign nations endeavour to combine contouring with hill relief by hachuring or shading; in this direction will be found the scientific map of the future, *Freshfield*, 4776, 4781-2. His ideal map would have contours filled in with brushwork, *Walker*, 5463-4.
 3. *Whether the hill features should be printed in colour.*
Has tried experiments in printing hills in colour; prefers black personally, *Wilson*, 652-7. Every foreign country has a map printed in black, with hills in black, and has in addition other scales printed in colour, *ib.*, 657. Thinks there might be two editions, one in black and one in brown, until the taste of the public is ascertained, *ib.*, 5691-2.
Would like contour lines printed in black with the hill features in brown, *Bartholomew*, 1738; *Freshfield*, 4787-90.
It is desirable that hills should be given in a colour other than that in which the other features are given, *Wilkinson*, 4619 *et seq.* Prefer hills in brown, *Johnston*, 2821; *Leane*, 3809; *Fuller*, 4272.
Would not advise change from black to colour, *Binnie*, 5244. Prefers hills in black, *Merivale*, 5303.
 4. *As to the relative advantages of contouring and hill-shading as a means of representing ground.*
The feeling has now grown up that contours are the best mode of representing ground, *Wilson*, 560. If there were sufficient contours to show shape and form of the ground clearly, the hill-shaded map would not be required, *Crook*, 813-9. The general public comprehend hill-shading, but do not comprehend contouring, *Chambers*, 3398, 3485. Contouring is more serviceable than hill-shading to railway engineers, *Cooper*, 3530. For engineering purposes would be content with contours, but for general purposes hill-shading is satisfactory, *Leane*, 3810. A hill-shaded map is a prettier picture, but for practical use a map with contours is better, *Merivale*, 5298. Contoured maps are very serviceable to engineers, but hill-shaded maps are indispensable for the general public, *Walker*, 5454-5.

5. *Whether the heliogravure process could be adopted with advantage.*

Went very thoroughly into the question and found that the adoption of this process would not advance the progress of the hill-shaded map to any great extent, while a portion of the country would be published in one style and a portion in another, *Wilson*, 202, 250, p. 225. Is of opinion that it would be a very grave mistake to abandon the present system of hill engraving, *ib.*, 5720, p. 225.

Suggests the employment of heliogravure, and states that this process is five times as rapid and one fourth the cost of engraving and produces substantially the same kind of shading, *Wilkinson*, 4648 *et seq.* Thinks this process would be very serviceable in supplying immediate wants pending completion and publication of engraved map, *Walker*, 5480, 5499.

I.

INDEXES:

1. *General.*
 2. *Whether more names are required on the 1-inch index.*
 3. *Whether there should be a separate index for each scale, or a combined index.*
 4. *Whether existing indexes of towns are satisfactory.*
1. *General.*
The scale should be given in words as well as in figures, *Stanford*, 2541 *et seq.* Complains of the confusion in numbering of sheets which come on county boundaries, *Wyld*, 1981-2000. Indexes should be all printed in black, *ib.*, 2030, 2022 *et seq.* They should be printed as far as possible on the same sized sheets, *Cooper*, 3645-6. Complains that the names of ecclesiastical parishes are put on the maps, and of civil on the indexes, *Crook*, 1473. The dates of the field work should be given on the indexes, *Walker*, 5467, 5480.
States that the coast-line of the 1-inch index is incorrect, *Crook*, 1450; and see *Wilson*, p. 221. The outline of the 1-inch index is sufficiently accurate, *Stanford*, 2603.
The Department might issue diagrams showing progress of publication, *Crook*, 1489 *et seq.*; and see *Stanford*, 2692-7. It would be the greatest boon if the Department were to send the weekly list of new maps published direct to certain of the trade, *Wyld*, 2982-9.
The price of indexes should be reduced to the very lowest possible limit, *Leach*, 3919. Indexes should be given away, *Johnston*, 2923; *Stanford*, 2646.
The issue of indexes should precede the publication of the maps, *Crook*, 1489. Directly the first sheet is out, wants the whole index, *Stanford*, 2551-5, 2698-700.
The table of areas should be removed from the 6-inch index and put in book form, *Stanford*, 2574-5. This table is not required on the index, *Walker*, 5480. Suggests that the 6-inch indexes of towns be published as skeleton maps, *Crook*, 1219-24.
 2. *Whether more names are required on the 1-inch index.*
Proposes to insert the name of the town from which each sheet takes its title, *Wilson*, 5880. More names are required, *Wyld*, 2008-18. It is desirable to have one name on each quarter sheet, *Stanford*, 2605.
Has never received any complaint as to a difficulty in identifying particular sheets, *Geikie*, 3040.
 3. *Whether there should be a separate index for each scale, or a combined index.*
There should be a separate index for the 25-inch, 6-inch, and 1-inch scales, *Crook*, 1483; *Wyld*, 2030, 1979 *et seq.*; *Wheler*, 2223; *Stanford*, 2538.
The same map should be used for the 6-inch and 25-inch index, the sheet lines only being charged, *Wyld*, 2030, 1979 *et seq.* There must be an index for each parish, as well as an index for each county, *Leach*, 3911, 3917; *Fuller*, 4199 *et seq.*
A combined index should be supplied, as well as separate indexes, for the use of engineers, *Wilson*, 5881. Prefer one combined index with sheet lines printed in different colours, *Johnston*, 2909, 2922-3; *Cooper*, 3647; *Fuller*, 4208.
 4. *Whether existing indexes of towns are satisfactory.*
They are fairly good, *Wyld*, 2034. They are satisfactory, *Stanford*, 2541. A scale of 1 mile to an inch is quite big enough for these indexes, *Johnston*, 2915

Discussion as to whether a photographic enlargement of the 25-inch map would answer this purpose, 4711-3, 4722-7. Has found no errors of any great importance in the 25-inch map, 4729.

Thinks the paper used is of an inferior quality and asks for a thick drawing paper, 4731-5. Asks for revision every 10 years, 4747. Thinks the 6-inch photo-zinco map is quite good enough, and that the price is reasonable, 4749.

LITHOGRAPHY:

See ZINCOGRAPHY.

M.

MAPS:

1. Maps on additional scales.
2. Maps produced by private firms.
3. Maps on small scales.

1. Maps on additional scales.

Asks for a 2-inch map in outline, with important roads, rivers, &c., for tourist purposes, *Chambers*, 3452 *et seq.*; also see *Freshfield*, 4859.

Also for a 12-inch map of London for laying out sewers, new streets, &c., *Binnie*, 5144-53.

Asks for a 40-inch map showing little detail for mining purposes, *Lewis*, 4702 *et seq.* The 25-inch map meets all the reasonable requirements of mining engineers in the north of England, *Merivale*, 5260-6. See Appendix I.

It would be the greatest mistake to have any more scales, *Cooper*, 3694.

2. Maps produced by private firms.

Has made a 15-inch map of Edinburgh, *Bartholomew*, 1594 *et seq.* Is now preparing a 12-inch plan of Glasgow; this scale the authorities decided was most useful for showing gas pipes, drain pipes, &c., *ib.*, 1612 *et seq.* Revises annually the 6-inch map of Edinburgh, and sells about 2,000 copies; it is largely used by the city authorities, *Johnston*, 2795 *et seq.*

3. Maps on small scales.

See COLOUR PRINTING, sub-head 5.

MERIDIANS:

1. General.
2. Whether any practical difficulty results from the number of different meridians.

1. General.

The original idea in starting the Survey was that each parish and county should be complete in itself, hence each county was at first drawn on its own meridian, *Wilson*, 5760. Afterwards as many counties as possible were drawn on the same meridian, *ib.*, *ib.* The number of meridians is now being reduced in drawing the 25-inch plans of Scotland, *ib.*, 5761-2. Has very rarely heard any complaints as regards the difference of meridians, *ib.*, 5760. The cost of changing even half the meridians would be enormous, *ib.*, *ib.*

The whole of the 6-inch maps of the kingdom, except the very recent ones, terminate at the county boundaries, *Crook*, 1192. It is too late to adopt any other system of meridians, but the inconvenience arising therefrom is largely mitigated by inserting—as is now done—on border maps of each county the contiguous detail of the adjoining county, *Walker*, 5467. It is very desirable to have as few meridians as possible, *Leach*, 3939-46.

Description of the system of meridians adopted in India, *ib.*, 5467 *et seq.*

2. Whether any practical difficulty results from the number of different meridians.

There is no serious difficulty in combining sheets of adjacent counties, *Wilson*, 5763. It is utterly impossible to combine the sheets of adjacent counties, *Crook*, 1192 *et seq.* Has worked across England from east to west, and never found any practical difficulty, *Cooper*, 3576-80. There is practically no difficulty in working from east to west, the maps can be joined whether the meridian is the same or not, *Leane*, 3740.

MERIVALE, Professor, J. H. (Analysis of his Evidence.)

Is a mining engineer in the north of England, 4851-2.

States that mining engineers use the 6-inch map very largely as a royalty map and for tracings for lenses, 5254. The 25-inch is used for working plans,

ib. Would be glad to have a special edition of this map without trees, 5257, 5275.

For mining engineers in the north of England the 6-inch and 25-inch maps meet all reasonable requirements, 5260. The system in the north is to assess rents upon the ton, in the south upon the acre, so cannot say what the requirements of the latter may be, 5264. The Mines Inspection Act of 1857 requires a scale of not less than 25 inches, 5265.

Asks that the centres of boreholes and shafts may be shown, 5260.

Complains that the 6-inch map is very deficient in contours, 5276. Most engineers in the north would be satisfied with 50-foot contours, *ib.* They should be continued over the whole coal area, 5278. Contours in mining districts will want constantly revising, 5283-4. Contrasts hill-shaded and contoured maps, thinks contoured maps are of more practical use, 5296-5300. Does not care for hills printed in colour, 5301-3. The present method of showing contours in black dotted lines is satisfactory, 5305.

A thick drawing paper is required for maps for mining purposes, 5308. Thin paper would be best for carrying in the pocket, *ib.*

Thinks that a key to conventional signs might be printed in the margin of maps, 5309-11. Would like to see the 1-inch map printed in colour for tourist purposes, 5312-6.

There should be a legal obligation on every body—surveyors of local bodies and county councils, railway and mining engineers, and private owners—to send in notices of alterations to the Ordnance Survey, 5324-37.

The 6-inch map is cheap at 1s. 3d., but if the price were lowered the sale might be largely increased, 5346-54. Has no difficulty personally in getting what maps he wants because he has access to the necessary indexes, 5355. States that the local agent at Newcastle does not keep any stock of maps, 5357.

As to the impossibility of getting a material on which to print maps which will not alter in size or shape, 5358 *et seq.*

Thinks that Government does quite sufficient in publishing maps on the 10-foot, 25-inch, 6-inch, and 1-inch scales, 5367. The half-inch scale is too small for use, either for a tourist or mining engineer, 5366.

MORHAM, Mr. R. (Analysis of his Evidence.)

Is City architect and Superintendent of Works in Edinburgh, 3053.

States that in 1877 the city paid a considerable amount to have their map revised, 3059. The borough engineer has a regular system of correcting it, and his maps are available for anyone who wishes to see them, 3062.

Coloured plans are very expensive, 3081. Prefers a hatched plan to a skeleton plan, but thinks a stippled plan preferable to either, 3082-3.

A period of five years for revision would be reasonable, revision every year is too much to expect, 3084-6.

Thinks that a legal obligation on town surveyors to send tracings of all drawings sent to them on the scale of the city map to the Ordnance Survey would be very useful in aiding revision, 3087. But only as a means of drawing attention to such alterations with a view to checking them, 3088.

Prefers a 5-foot engraved map to a 10-foot zinco-graphed map, but if both were produced in the same style, would prefer the 10-foot map, 3093-9. Would be glad to have a good many more levels shown, 3100-6; see *Wilson*, p. 222. Thinks that the detail of private gardens might be omitted, 3107-8.

MOUNTING MAPS:

When maps are demanded by the agent for mounting, they are always supplied on the same kind of paper, *Wilson*, 515-6.

For complaints of difficulty in mounting maps owing to shrinkage and difference of colour of the paper, see *Wyld*, 2060-6. *Lewis*, 4730-2. This difficulty is felt most with the 6-inch maps, *Stanford*, 2468-77. And in joining maps printed from zinc with those printed from copper, *Currie*, 2876.

As to impossibility of surmounting this difficulty see *Merivale*, 5358 *et seq.*

MURRAY, Mr. A. (Analysis of his Evidence.)

Is City Surveyor to the Corporation of London, 3115.

Speaks of the 5-foot map of London, 3116 *et seq.* Has hardly ever found a mistake in it, 3117. Ex-

plains the purposes for which he uses it, 3120, 3132, 3134.

The 5-foot scale is big enough for his purpose, 3125-7. But it is not big enough for plans for leases, 3189-91. There have been a great many changes in the city, which is much in need of revision, 3135-6.

Prefers a skeleton plan to one hatched or coloured, 3145-7. If the hatching were done lighter, would not object to have only one edition hatched, 3148-9.

Thinks a good deal of detail might be omitted, such as lamp-posts and the detail of public buildings, 3153-65.

Observations as to how far town surveyors can assist revision by sending in plans of alterations to the Ordnance Survey, 3137, 3171-8. Such plans could not be accepted by the Survey without examination, 3176. The extension of the triangulation to growing districts outside towns would be of use, but would not care to have skeleton plans of such districts, 3193-9. Finds that surveys made by local surveyors vary greatly in their accuracy, 3201-2.

N.

NAMES:

1. *General.*
2. *Whether there are sufficient names on the 1-inch map.*
3. *As to the spelling of names.*
4. *As to complaints of errors in Welsh names.*

1. *General.*

All names as collected are written down in name books with the names of three authorities who have vouched for them, *Wilson*, 481-3. In Scotland received gratuitous assistance from Gaelic scholars in collecting names, *ib.*, 485. The Irish names were collected by one of the best Irish scholars of the time, *ib.*, 488.

2. *Whether there are sufficient names on the 1-inch map.*

As to the manner in which the names are selected, *Wilson*, 629-32. There are not so many names inserted now as formerly, *ib.*, 626. There are enough names, *Crook*, 1337. Does not think there are too many names, *Leane*, 3799.

A great many more names might have been usefully inserted, *Wyld*, 2051-7. It is inconveniently crowded with names not of general interest, *Chambers*, 3401-11. Objects to the disfigurement of by parish names, *ib.*, 3393. More care should be taken in the selection of names, *Freshfield*, 4828-9.

3. *As to the spelling of names.*

Has heard great dissatisfaction expressed with the Ordnance spelling of names in Scotland, *Bartholomew*, 1666. Criticises the spelling of certain compound names, *Chambers*, 3418-23.

The vernacular spelling should not be recognised, *Wheler*, 2255-6. Is not in favour of the national map being used to keep up county dialects, *ib.*, 2258. Sometimes it is desirable to give the phonetic as well as the proper spelling of Celtic names, *Geikie*, 3034.

See ERRORS.

4. *As to complaints of errors in Welsh names.*

All Welsh names were vouched for by a Mr. Rowland, who was reputed to be a very good Welsh scholar, and after his death by Mrs. Rowland, *Wilson*, 484; *Jones*, 6042.

Complaints of the spelling and selection of names, *Evans*, 5507-9. There are over 50 errors in the map of Glamorgau, *ib.*, 5571; Appendix X; see *Jones*, 6049. Produces a list of errors and omissions in names, and explains them, *Williams*, 5578 *et seq.*, 5603, 5605. Errors were caused by the ignorance of the surveyors, who could not speak a word of Welsh, *ib.*, 5601-3; *Jones*, 6112.

Explanation of the systems of spelling, *Evans*, 5528 *et seq.* Makes suggestions for revising the spelling, *ib.*, 5508a *et seq.* Where literary form is uncertain would give the phonetic spelling, *Williams*, 5579, 5611. Produces the "Instructions for Examiners" in collecting names drawn up by Mr. Rowland and himself, *Jones*, 6117 *et seq.* In the case of a house the local pronunciation should be given, if locally established, *Jones*, 6094.

Suggests that one man should be appointed and made responsible for the revision of names in the whole of Wales, *Evans*, 5520 *et seq.* Thinks that a separate person should be appointed to revise the

names in each district, *Williams*, 5611. It is essential that the surveyors should be attended by someone speaking Welsh, *ib.*, 5614-7. Suggests sending a list of names to the clergymen or overseers of the parishes, *Jones*, 6124.

Errors are so considerable that all the sheets he knows of should be revised, *Williams*, 5618. Has not heard many complaints of errors in names in his district, *Jones*, 6130. Objects to the introduction of new characters into the Ordnance maps, *Jones*, 6051 *et seq.*

See Appendices XIX., XX.; ERRORS; INDEXES.

O.

ONE-INCH MAP:

Memorandum on the 1-inch map, *Wilson*, p. 224. For dates of survey and publication of the 1-inch map, see Appendix V.

As to the re-numbering of the sheets of the new series originally published as part of the old series, see *Crook*, 709-20, and *Wilson*, p. 218.

Asks that small detached portions be shown in the margin of the maps, so as to avoid the necessity of buying another sheet, *Crook*, 1340-1.

See BOUNDARIES; COMPLETION OF SURVEY; DELAY; DETAIL; ENGRAVING; PAPER; PRICES OF MAPS; STYLE OF MAPS.

That a cheap edition of the 1-inch map should be produced by transfer to zinc or stone.

Has proposed a cheap sixpenny edition of the 1-inch map by transfer to zinc, *Wilson*, 597; *Walker*, 5467. It would be better for general purposes to print from stone, *Bartholomew*, 1872. Impressions from stone as nearly as good in artistic appearance, and quite as good for all useful purposes as those from copper, *Johnston*, 2939.

P.

PAPER:

1. *General.*
2. *As to want of uniformity and inferior quality of paper used for different maps.*
3. *Possibility of securing uniformity.*
4. *Drawing papers are bad printing papers.*
5. *Storage of paper.*

1. *General.*

Manner of obtaining paper through the Stationery Office, *Johnston*, Major, 1506-11. Recently the paper received has been satisfactory, *Wilson*, 5727-9. From Survey point of view it is desirable that the Department should buy their own paper, *ib.*, 5726, 5732. The Admiralty obtain their paper from the Stationery Office and at times have had a good deal of trouble in getting a uniform supply, *Wharton*, 4990 *et seq.* Desirable that a contract should be made with one firm for a term of 10 to 15 years, *Wilson*, 5725. Very important to have a standard paper for each class of map, *ib.*, 5723; *Leach*, 4054.

A cheaper class of paper might be used for the Ordnance maps, *Johnston*, 2760-6; *Currie*, 2371-2. Does not recommend cheap papers, they tear and crack, *Wyld*, 2962, 2965, 2950. Best work in printing is done on dry paper, for which a better finish is required, *Currie*, 2863-4.

The public require a strong paper, so maps have been printed on a kind of drawing paper, *Johnston*, Major, 1500. Maps should be printed on a thick or hard drawing paper: see *Broom*, 4132, *Lewis*, 4735, as to large scales; *Cooper*, 3589, *Binnie*, 5172-9, as to 6-inch scale; *Leane*, 3813-6, as to 1-inch and other scales. The outline edition of the 1-inch map might be printed on thick paper, the hill edition on the best kind of printing paper, *Crook*, 1521.

2. *As to want of uniformity and inferior quality of paper used for different maps.*

(a.) *Paper for town plans, 25-inch, and engraved 6-inch.*

Crook, 1527, *Stanford*, 2447, approve of. *Lewis*, 4732-4, *Allison*, 4375-81, complain of.

(b.) *Paper for 6-inch photo-zinc map.*

Complaints of this paper are made by *Crook*, 1095-6; *Stanford*, 2470; *Cooper*, 3581-6, 3591; *Leach*, 4048; *Fuller*, 4159-63; *Binnie*, 5092.

3. *Possibility of securing uniformity.*

The same paper cannot well be used for printing from both copper and zinc, *Wilson*, 5733. There is not the slightest difficulty in getting uniformity of thickness and colour year by year, *Wyld*, 2071. Obtains all paper from one mill, it is of about the same quality every year, *Currie*, 2880-1.

4. *Drawing papers are bad printing papers.*

The drawing paper now used is not the best paper for giving clear impressions, but best printing papers are not tough enough, *Johnston*, Major, 1499, 1517. The rough surface of the paper used causes haziness of the outline, *Crook*, 1520. The size introduced into drawing papers makes them difficult to print on, *Currie*, 2875.

5. *Storage of paper.*

Paper does not depreciate in any shape or form by being kept, *Wyld*, 2069. Does not care to stock paper for more than three or four months, *Currie*, 2883. Paper deteriorates unless kept in large bulk, and is liable to fade, *Wyld*, 2962-3.

See THIN TOUGH PAPER.

PHOTO-ZINCOGRAPHY:

This process was introduced in 1880 in order to bring out the 6-inch map more rapidly, *Wilson*, 493. A very great saving was effected by doing this, many years in time and a large amount of money, *ib.*, 507. For scales above 1-inch photo-lithography or photo-zincography is the simplest method of producing plans for publication and would be satisfactory, *Bartholomew*, 1884. It produces plans more quickly than any other process, the style is not artistic, but it is sufficient for practical purposes, *Walker*, 5435-6. Very good results by this process have been produced by the Ordnance Survey, the complaints made about these maps are most unreasonable, *ib.*, 5480. The 1-inch map of India is entirely produced by photo-lithography or lithography, *ib.*, 5428. It can only reproduce drawings in lines, it cannot reproduce brush drawings, *ib.*, 5480.

See STYLE OF MAPS; ZINCOGRAPHY.

PRICES OF ORDNANCE MAPS:

1. *General.*
2. *Of large-scale maps.*
3. *Of 6-inch photo-zinco map.*
4. *Of 1-inch engraved map.*
5. *Comparison of prices with those of foreign maps.*

1. *General.*

Statement of changes in prices since 1866, *Wilson*, 600-1. Prices of all maps are too dear to get a large sale to the public, *Johnston*, 2718-23, 2728, 2756, 2770. For the work there is on the maps they are very cheap indeed, but if the price was reduced by one half, there would be a very much larger sale, *Fuller*, 4179, 4197.

The selling price is based on the cost of production, leaving a margin for the correction of plates and new editions; for engraved maps the cost is charged after the completion of the copper-plates, for photo-zinco maps after the supply of the transfer, *Wilson*, 542-5, 602-5, 5821-4, and see Appendix IX.

2. *Of large-scale maps.*

25-inch map is cheap at 2s. 6d., *Stanford*, 2445. Price of 1/500 zincographed maps should be reduced, *Allison*, 4289, 4365-6. Reduction in price of large scale photo-zinco maps is most necessary, *Walker*, 5467.

3. *Of 6-inch photo-zinco map.*

This map might be cheapened, because the public have to pay 4s. for four quarter-sheets containing the same area as one engraved sheet at 2s. 6d., *Wilson*, 537-540; *Crook*, 1099. The reason of this being that there is a larger proportion of the cost of production charged, and there are also four pulls instead of one, *Wilson*, 541-5. Reduction in price is most necessary, *Walker*, 5467. If the map were cheaper, there might be a larger sale, *Merivale*, 5346-54. There is not much to complain of in the price, *Lewis*, 4749.

4. *Of 1-inch engraved map.*

It is a cheap map, *Wilson*, 597. The Scotch map is 12½ per cent. cheaper than the English one, *Crook*, 1555. The price of the outline sheets might be reduced, *Walker*, 5467.

5. *Comparison of prices with those of foreign maps.*

See Appendix VI., and *Crook*, 1554.

See AREAS; COLOURED IMPRESSIONS.

PRIVATE FIRMS:

See COLOUR PRINTING, sub-head 6; MAPS, sub-head 2.

PROOFS:

Examination of proofs by local residents.

It would cause very great delay to exhibit map publicly before publication, *Wilson*, 480. Proofs might be submitted to the clergymen of the parish or mayor of the town, *Freshfield*, 4830-3. Also see *Ryde*, 4498-4501.

PROPERTY BOUNDARIES:

The Ordnance Survey does not and could not attempt to show the boundaries of property, *Leach*, 3863, 3887; *Wheler*, 2244-5. It is not within the competence of any mapmaker to investigate the question of property boundaries, *Brickdale*, 5954.

The actual boundaries of property should be shown on the maps as well as the physical feature, *Ryde*, 4419-30.

There is not much difficulty in allowing for difference between actual and physical boundaries in estimating the areas of property, *Brickdale*, 5954. System of dealing with property boundaries adopted in the Land Registry Office, *ib.*, 5996-8.

PUBLICATION

The publication is really at the root of the revision question,—viz., the difficulty and expense of revising and republishing the enormous number of plans which have been produced, *Wilson*, 94, 97, 98, 224-8, 5801. Suggests that revised editions be only published at the request of and at the cost of the town, *ib.*, 5801.

The publication of town plans is an impediment to their usefulness; would prefer the plans to be kept in manuscript in the towns and available for reference by the public, *Brickdale*, 6006.

The 6-inch plans of Ireland were originally engraved, because six copies were required, and it was considered cheaper to engrave than to trace them, *Wilson*, 606.

R.

RAILWAYS:

Distinction should be made between double and single lines on the 1-inch map, *Crook*, 1314.

Return of new railways opened is sent to the Department every year by the Board of Trade; men are sent to survey these railways and they are then engraved on the 1-inch map, *Wilson*, 257.

REFERENCE NUMBERS:

See AREAS.

REPRODUCTION OF ORDNANCE MAPS:

See COLOUR PRINTING, Sub-head 6.

REVISION:

1. *General.*
2. *As to the pressing need for revision.*
3. *The labour and expense of revision is much increased by postponing it.*
4. *Cost of revision.*
5. *Periods suggested for revision.*
6. *Revision of the 1-inch map.*
7. *Revision of town plans.*
8. *To what extent towns keep up their town maps.*
9. *Whether the State should bear the expense of keeping up town plans.*
10. *As to plans of alterations being sent to the Department by borough and other local surveyors, &c.*

1. *General.*

Statement as to revision centres he proposes for carrying out the revision, *Wilson*, 241, 267-8, 322-6. Suggestions as to mode of carrying out the revision, *Crook*, 927 et seq.; Appendix XI. It would be a great mistake to carry decentralization too far, *Fuller*, 4237-42.

Method of revision adopted for German staff maps *Wilson*, 5676-9. For French maps, Appendix VIII.; *Crook*, 1353-4.

2. As to the pressing need of revision.

The revision of Yorkshire and Lancashire has in many places necessitated a re-survey, this will also be the case in Tyneside, *Wilson*, 20, 221. Revision is the most important thing for conveying purposes, *Brickdale*, 5942, 5990-3; *Wheler*, 2367. Opinion of Colonel Colby, that if maps were not periodically revised it would be better to be without a large-scale survey, *Wilson*, 221. In revision we are far behind several of the great countries of Europe, *Freshfield*, 4754a, 4755. The absence of periodical revision is a very great blot, *Wharion*, 5084. Hopes that the plans may not be allowed to become useless through false economy in refusing the necessary money for revision, *Wheler*, 2289. Better without the large-scale maps if not up to date, *Johnston*, 2804. See also *Bartholomew*, 1594, 1650; *Wyld*, 1946; *Murray*, 3135; *Wilkinson*, 4609.

3. The labour and expense of revision is much increased by postponing it.

It takes less time to revise towns year by year than to do so every 40 years, *Crook*, 1032. If things are kept up to date there is little expense, but when five or six years in abeyance the expense is very great, *Wyld*, 1955. If the survey is too long without revision the ultimate cost of revision is largely increased, *Leach*, 3949.

4. Cost of revision.

Estimate of cost of revision of the large-scale maps, *Wilson*, 221-4, 309-10, 355-62; Appendix C. Estimate of cost of revising the 1-inch map, *ib.*, 5653-7, 5668-72; Appendix B. The cost of this is already partly provided for, *ib.*, 343-4. Statement of amount now spent on revision, *ib.*, 5764-78. Also see Appendix XIV.

5. Periods suggested for revision.

Towns every 5 years, agricultural districts every 15 to 20 years, *Wilson*, 319. Revision of towns every 5 years is reasonable, *Morham*, 3085-6; *Till*, 3340; *Leane*, 3789; *Fuller*, 4243. Town plans should be corrected continuously, *Crook*, 1029. Continuous revision of towns is impracticable on account of the expense, *Leach*, 3948; *Allison*, 4323. Towns every 10 years, *Broom*, 4136; *Allison*, 4289, 4320. London continuously, large towns every 5 or 10 years, mining or manufacturing districts every 10 or 15 years, agricultural districts much longer, *Binnie*, 5097. Whole country every 15 years, including towns, *Leach*, 3949, 3972. Country districts every 15 years, *Leane*, 3787. Every 10 years, *Fuller*, 4243-8. Agricultural districts every 30 years, *Allison*, 4289. Suburbs of towns must be revised every year to be of use for conveying, *Brickdale*, 5944. The 1-inch map should be corrected annually, *Bartholomew*, 1682.

6. Revision of the 1-inch map.

a. General.

The 1-inch map has never been revised, but new railways have been inserted, *Wilson*, 137-41. The revision would have been started before if engravers had been available, *ib.*, 243. Proposes to start revision at once, and states how he proposes to do this, *ib.*, 335-41, 5650-1, 5673-6, 5679-80. If revision commenced this year could produce the whole map in a perfect state by the end of 1896, *ib.*, 641.

The revision of the 1-inch map in Ireland has been authorised a great number of years, *ib.*, 5658.

b. Whether it is advisable to separate the revision of the 1-inch map from that of the cadastral work.

Proposes that the revision of the 1-inch map should be kept entirely distinct from the cadastral revision, *Wilson*, 239-40. Is most strongly of this opinion, *Crook*, 829, and see *Bartholomew*, 1683, 1823.

Would not separate the revision of the 1-inch map from that of the cadastral survey, *Leach*, 3952-4, 3959.

c. As to the amount of revision necessary.

The revision of the 1-inch would not be nearly so heavy as people generally imagine; alterations in roads are very slight, *Wilson*, 242, 5659-66. A great deal of revision will not be required, as a rule, *Leach*, 3882, 3950-1, 3957-8.

A good deal of correction is required for tourist purposes, *Bartholomew*, 1649-51.

7. Revision of town plans.

Towns should pay the Department to keep their plans up to date, *Crook*, 953. A competent staff in each town would be dearer than the Ordnance Survey doing the work, *ib.*, 1028. Plans made locally are

sometimes very inaccurate, *Murray*, 3201-2. Would prefer to pay the Department to revise his town map than to do it himself, *Broom*, 4102.

Suggests handing over the town plans to the towns to be revised by them at short intervals and corrected by the Department at longer intervals, tracings being supplied to the public at cost price, *Brickdale*, 5999 *et seq.*, 6010-6. If towns keep up their own plans their work should be checked by the Department, *Wheler*, 2275 *et seq.* Plans might be revised by borough surveyors under proper inspection from head-quarters, *Johnston*, 2787 *et seq.* Local authorities would like to have their plans checked by the Department, *Broom*, 4109. And see *Wilson*, p. 223.

8. To what extent towns keep up their town maps.

In many large towns it is done, but the majority of towns keep them up very badly, *Crook*, 917-9. The Public Health Act does not compel this, only advises it, *ib.*, 952. The borough engineer has a regular system of correcting the map of Edinburgh, *Morham*, 3062. Has revised the plans of St. Helens in the style of the Ordnance plans, *Broom*, 4081 *et seq.* Thinks this is the usual practice in large towns, *ib.*, 4090. Borough surveyors keep up their plans very accurately as a rule, *Fuller*, 4227 *et seq.* Revises the map of Manchester every two or three years by putting on the buildings in block, *Allison*, 4290-3. Revises the town map of Eastbourne showing the houses in block, *Tomes*, 4512, 4526.

9. Whether the State should bear the expense of keeping up town plans.

The State is extremely liberal to the towns, it should not pay for all town plans, *Crook*, 897-8. Borough surveyors must keep their map up to date for municipal purposes, so expense might properly be charged to the towns, *Leach*, 3974 *et seq.* Towns must keep up their plans, so there would be nothing against compelling towns to pay at least part of the cost of their town maps, *Tomes*, 4531. The large-scale maps are almost exclusively required for municipal purposes, *Allison*, 4299 *et seq.* All national requirements are met by the 25-inch map, *Tomes*, 4528-30.

It is the duty of the State to keep up the plans, *Allison*, 4289, 4299 *et seq.*

10. As to plans of alterations being sent to the Department by borough and other local surveyors, &c.

a. To what extent this would be advantageous.

It would not be safe to put on the Ordnance maps any work which had not been checked by the Ordnance surveyors, *Wilson*, 258-264; *Crook*, 950-1, 1018 *et seq.*; *Morham*, 3087-8; *Murray*, 3176; *Till*, 3265, 3275; *Leane*, 3711; *Leach*, 3960-7; *Allison*, 4319; *Binnie*, 5102.

It is as a rule better to make a new survey than to correct bad work, *Crook*, 952; *Wyld*, 1948-53; *Leane*, 3712.

b. Whether such a course is advisable and feasible.

City surveyors might send in notices of alterations in the shape of rough corrections of the Ordnance maps, *Wilson*, 279-85. (Different public departments should send information as to railways, roads, canals, docks, *ib.*, 5673, 5679-80. There would be no difficulty in sending copies of alterations on the town map to Southampton, *Murray*, 3137, 3172 *et seq.*; *Chambers*, 3498-501. Suggests that at least every third year the town should supply the Department with tracings of alterations, *Broom*, 4095.

c. Whether this course should be made compulsory by Statute.

There should be a legal obligation on all official and public bodies and private individuals to send in notices of alterations to the Department, *Cooper*, 3632 *et seq.*; *Merivale*, 5324-37.

Suggests that municipalities should be compelled to keep up their maps correctly, and supply tracings to the Department, *Allison*, 4311-2. There should be a legal obligation for county and borough surveyors to send in surveys, *Fuller*, 4225.

It would be a reasonable requirement to compel local authorities to send in drawings to the Department every year, *Binnie*, 5100-1; *Till*, 3273. Does not think the local authorities would object to being compelled to send in tracings of alterations every year to the Department, *Tomes*, 4520 *et seq.*; *Broom*, 4106-8.

See CONTOURING; PUBLICATION; TRIANGULATION.

RIGHT OF WAY :

The Department never inquires in the question of right of way, it would be impossible for it to do so, *Wilson*, 440-6. Considers that the Department is wise not to deal with this question, *Wheler*, 2238-43.

The Ordnance Survey should distinguish between private and public roads, *Bartholomew*, 1767-72. Has tried to do so, but got rather involved in legal proceeding, *ib.*, 1770.

See FOOTPATHS.

ROADS :

The present distinction between the different classes of roads is not satisfactory, *Crook*, 1260-2; *Bartholomew*, 1774; *Wyld*, 2049; *Freshfield*, 4795.

Suggestions for distinguishing between different classes of roads on maps, *Wyld*, 2048; *Freshfield*, 4800, 4806; and see *Johnston*, Major, 3208.

There should only be two classes of roads, *Wilson*, 5906; *Leach*, 4040-6; *Ryde*, 4495-7. Would prefer three classes, *Freshfield*, 4801-8.

The French *carte vicinale* shows six classes of roads, the Italian 2½ inch map, four classes, and the Italian 1½-inch map, two classes, *Johnston*, Major, 3209, 3213.

This is the only country which makes a distinction between fenced and unfenced roads, this is partly the cause of the existing confusion in the roads, *Freshfield*, 4795. It is proposed to do away with this distinction in accordance with the recommendation of the Military Committee, *Wilson*, 5905.

RYDE, Mr. E. (Analysis of his Evidence.)

Was President of the Surveyors' Institute some years ago, 4389. Has used a large number of all Ordnance maps, 4394.

Prefers a hatched map to a coloured map, 4404. But for surveyor's purposes prefers plans neither hatched nor coloured, 4400. Approves of the shaded line to one side of buildings, 4412-3.

Has found occasional errors in the position of fences upon the 25-inch maps, 4414-8. Suggests that the boundaries of properties be shown on the Ordnance maps, 4420 *et seq.*

Would leave out trees in hedgerows, but would show isolated trees in parks, without attempting to plot them, 4431-9.

Prefers areas stamped on plans to area books, 4442. Thinks the numbering of areas is very useful, but not sufficiently so to justify a large extra expenditure on retaining them, 4443 *et seq.*, 4452, 4455. For purposes of local assessment the numbers are not of any value, 4467-8. For assessment purposes the Ordnance maps are used to indicate the property, and to give the acreage, 4458-66, 4469-72.

The photo-zinco 6-inch is a good enough map, 4473-4.

Complains that mere workmen's tracks are shown as footpaths, 4480 *et seq.* Thinks greater caution should be taken in indicating footpaths, 4491. Suggests that footpaths would be better shown by dots placed farther apart, 4494. It would be sufficient to distinguish only two classes of roads, 4495-7.

Observations as to the possibility of getting persons with local knowledge to look over the proofs of plans, 4498-4501.

S

SALE OF MAPS :

1. General.
2. As to reasons for the small sale of the Ordnance maps.
3. Suggestions for extending the sale.
4. Whether it is advisable to continue the sale of the uncountoured edition of the 6-inch map.

1. General.

There is in store at Southampton a stock of two or three million impressions, worth about a quarter of a million of money, *Wilson*, 606-7. When the revision takes place the old maps will have to be condemned *ib.*, 608-9. As to profit on the sale of maps, *ib.*, 620-5 610.

Under a good system of sale, there would be a very large sale for small-scale maps, but never a large sale for large-scale maps, *Wilson*, 5819; *Till*, 3358-9. The demand for maps is very unequal, but every sheet has a certain sale, *Wilson*, 612-9. As to

general demand for maps, *Stanford*, 2386-90, 2510-1, 2524-8. The Department has nothing to do with the advertisement or sale of maps, and has absolutely no control over any circulars the agent issues, *Wilson*, 384, 5913.

2. As to the reasons for the small sale of Ordnance maps.

Mainly due to the fact of their not being brought before the notice of the public, *Bartholomew*, 1654-9, 1754-61. Due to their not being popularly sold in towns, *Wheler*, 2083-5. To the provincial agencies being unsatisfactory, *Freshfield*, 4810. Largely due to the want of revision, *Fuller*, 4196, 4199. Many educated people never see the plans, they are almost unknown to the middle and lower classes: the maps being on stiff paper and the system of agency militate against the sale, *Galton*, 4569. The indexes not being quite satisfactory and the ignorance of the public as to the operations of the Survey are the main reasons for the small sale, *Stanford*, 2400-5.

In Scotland the sale of outline sheets is 17 times as great as that of hill sheets, *Wilson*, 83, 86. Chiefly due to the very large use of the outline plans for administrative purposes, *ib.*, 208-9, 213. Often a complete set of hill maps is not obtainable, so the public prefer to buy the outline maps, *Crook*, 805-12. Attributes this largely to the absence of information to the public as to hill-shading, *Wilkinson*, 4615-6. Advocates a pamphlet being issued giving explanations, *ib.*, 4642-5.

3. Suggestions for extending the sale.

Suggests that indexes should be given to all public libraries, *Crook*, 1573. Country agents should have maps on sale or return, *Stanford*, 2647. There should be more local agents, *Crook*, 1577-8; *Freshfield*, 4810; *Walker*, 5480. Maps might be sold through the medium of the post offices, *Wilson*, 5889-98; *Crook*, 1577; *Fuller*, 4278-83; *Galton*, 4569; *Freshfield*, 4811-2, 4821-4; *Walker*, 5480.

See AGENCY.

4. Whether it is advisable to continue the sale of the uncountoured edition of the 6-inch map.

Treasury authorised an uncountoured edition, and when countouring completed, a countoured edition: this final edition has now been published, *Wilson*, 553. The sale of the remainder of the uncountoured edition has been authorised at 8d. a sheet, *ib.*, 5752-3.

For remarks on the sale of, see *Crook*, 801-5; *Stanford*, 2481-4, 2490-1; *Johnston*, 2942-6; *Leach*, 4012-9; *Fuller*, 4250-9.

SIX-INCH MAP :

The English map was originally engraved by counties, but in 1880 the photo-zinco process was introduced to expedite the completion of it, *Wilson*, 493. 22 counties are engraved and 30 photo-zinco-graphed, *ib.*, 496. Have now ceased to engrave, but will revive existing maps on copper when practicable, *ib.*, 502-5. Hopes that the 6-inch sheets will eventually be engraved, *Wharton*, 5082.

The whole of the Irish 6-inch is engraved, *Wilson*, 273.

See COMPLETION OF SURVEY; CONVEYANCING; LAND VALUATION; PAPER; PRICE OF MAPS; PUBLICATION; SALE OF MAPS; SIZE OF MAPS; STYLE OF MAPS.

SIZE OF MAPS :

Whether whole or quarter-sheets are preferable for the 6-inch map.

The reason for publishing quarter-sheets is the mechanical difficulty in reducing sixteen 25-inch sheets by photography, *Wilson*, 546-50.

It is very seldom that a single quarter-sheet is required, *Crook*, 1105. Objects to quarter-sheets, thinks whole sheets would be useful for general purposes, *Cooper*, 3568, 3612-4. Prefers whole to quarter-sheets, *Wharton*, 5084. Large sheets would be desirable, *Leach*, 4048.

Does not object to the size of quarter-sheets, *Leane*, 3778.

SOUNDINGS :

Whether the depths of lakes and soundings round the coasts should be shown on the Ordnance Survey maps.

The depths of lakes would be useful for scientific purposes, *Wilson*, 594-5. It would be extremely interesting if depths of lakes were countoured, *Bartholomew*, 1910-2. The depths of lakes are very important for the study of physical geography, *Freshfield*, 4827.

It is highly desirable that a certain number of soundings round the coast should be inserted on the

Ordnance maps, *Wharton*, 5004-11; and see *Freshfield*, 4827-8.

It has never been considered the work of the Survey to take soundings of lakes, *Wilson*, 589. The Department could easily do it after a little experience, but the Admiralty would do it more economically, *ib.*, 590-3. The Admiralty cannot consider the sounding of lakes, *Wharton*, 5012-3.

There is not the least difficulty in the Admiralty supplying the information necessary for inserting soundings round the coast on the Ordnance maps, *ib.*, 4945-9.

STANFORD, Mr. E., junior. Sole Agent for the sale of Ordnance Maps for England and Wales. (Analysis of his Evidence.)

Complains that it is not possible always to obtain plans of even the same towns in one style, and instances the case of the town of Cambridge, 2368 *et seq.*; see *Wilson* p. 221.

General statement as to the sale of each class of map, 2524-8. There is a constant sale of town plans, 2386-90. Thinks there should be a greater demand for maps, 2390. Considers that the indexes, being not quite what is wanted, is the chief hindrance to the sale of maps, 2400-5; see *Wilson*, p. 221. Describes the system of sale as between his firm and the Department, and between his firm and the sub-agents, 2392-411. Country agents would increase their stock of maps considerably if they could get maps like books on sale or return, 2411.

Receives no complaints of inaccuracy in the 25-inch map except when it is obsolete, 2413-5. Receives a few complaints of errors in spelling of names, 2416-7.

Only stocks coloured impressions, 2418-21. Points out the great expense of some of the coloured sheets, and suggests that the price of all should be averaged, 2422-31. Observations on the relative advantages of hatching and colouring, 2424, 2433-40.

The 25-inch map is a cheap map, 2445. Thinks the paper used for it satisfactory, and that there would be no advantage in publishing an edition on thin paper, 2446-9. Has had great deal of difficulty in mounting plans, owing to the want of uniformity in the paper, but more especially with the 6-inch maps, 2468-77, 2492-4.

Observations on relative advantages of area books and areas printed on the plans, 2457-63. Thinks the latter method is much more desirable, 2463-6.

Thinks it beneath the dignity of the Department to offer the original uncoloured edition of the 6-inch map at a reduced price, 2481-4, 2490-1; see *Wilson*, p. 221. Does not think the majority of people care about contours, 2503-4. Does not consider it his business to complain to the Department as to the general quality of the maps, 2495-502, 2512-23, 2529-36; see *Wilson*, p. 221.

Thinks the indexes might be improved, 2537. Asks for a separate index for each scale, 2538. The scale to be shown in words as well as in figures, 2541-4. The index to be published directly the first sheet of the town or district is out, 2551-5, 2698-70. Complains that the index to the town plans of Manchester was issued in eight sections, 2547 *et seq.*; see *Wilson*, p. 221. Further observations on indexes, 2556-86. Thinks indexes should be put in book form, and that the table of areas should be omitted from the 6-inch index, 2574-5. On the 1-inch index it is desirable that there should be one name on each quarter sheet, 2605.

Thinks that the production of maps on scales below the 1-inch should be left to private publishers, 2587-9. Objects to the use of the word "Ordnance" by the trade in publishing maps reproduced from the Ordnance Survey, 2597-2601.

Is quite satisfied with the engraving of the 1-inch map in outline and with hills, 2612-9. Thinks the new 1-inch map with hills compares favourably with foreign productions, 2621. Criticizes the French *carte vicinale*, 2628-38. Does not think it is preferable to our 1-inch map, 2625. Does not recommend colour-printing for maps on the 1-inch scale, 2626-7.

Makes suggestions for bringing the Ordnance Survey maps more before the public, 2646-64. Suggests that index maps be issued gratis, 2646. Country booksellers might have maps on sale or return, 2647. Does not think the sale of maps will ever be much developed, unless the country booksellers keep a stock, 2655; see *Wilson*, p. 222.

Thinks it most objectionable to have published the 1-mile map as an old map, 2671. States that he only

asked for a transfer of this map for one county, 2674-6; see *Wilson*, p. 222. Would leave the production of a complete map on this scale to the trade, 2678.

A catalogue is essential to his business, 2679-83. Suggests that county catalogues of the 25-inch maps be added to it, 2684-9. And that the date of survey be added for each parish, 2689. Does not think there is any need to publish a progress map, 2692-7. It would be advantageous to have the agent's name printed on each map, 2701-14.

STYLE OF MAPS:

1. *Opinions on the general style of the 1-inch photo-zinco maps.*
2. *Opinions on the general style of the 1-inch engraved maps in outline.*
3. *Opinions on the general style of the 6-inch photo-zinco maps.*
4. *Opinions on the general style of the photo-zinco town maps.*

1. *Opinions on the general style of the 1-inch photo-zinco map.*

Reason why the photo-zinco map was brought out as an advanced edition of the 1-inch, *Leach*, 4052-3. It cannot be compared to the engraved 1-inch, *Wilson*, 169.

A very satisfactory map, there is all on it that is necessary, *Leane*, 3804. A very good map, *Binnie*, 5232. A very useful form for some purposes, *Wheler*, 2318. It would be perfectly useful for administrative purposes, *Crook*, 1281.

It is a mere apology for a map, it is a disgrace to produce such a map, in comparison with what they have abroad, *ib.*, 1228 *et seq.*

2. *Opinions on the general style of the 1-inch engraved map in outline.*

It is superior to any similar scale map he has ever seen, *Cooper*, 3691. It is very perfect, very satisfactory, *Walker*, 5451-2. Nothing could be better, *Binnie*, 5229. It is a beautiful map, *Leane*, 3795. The drawing is clearer and the style better than the old 1-inch map, *Bartholomew*, 1861, 1865.

Does not give as much information as continental maps, *Crook*, 1248. It is too full of unnecessary and inconvenient detail, *Chambers*, 3368.

3. *Opinions on the general style of the 6-inch photo-zinco map.*

A good practical map, equal to those of a similar kind he has seen elsewhere, *Wilson*, 506. The character of the map is perfectly satisfactory, *Till*, 3349. It is quite good enough, *Lewis*, 4749. It is good enough, *Ryde*, 4473-4.

The drawing is poor, rough, and even confused, *Binnie*, 5093, 5171. Complains of the want of uniformity in the sheets of the town of Gloucester, *Crook*, 1870-82. Greater attention should be paid to the delineation of topographical features, such as cliffs and reefs, *Geikie*, 3027 *et seq.*

As to 6-inch map generally, *Cooper*, 3690, says, "There is no map anywhere in the world to compare with it."

4. *Opinions as to the general style of the photo-zinco town plans*

They are good enough for any one, *Crook*, 993. It is a very good map indeed, *Till*, 3237.

Compares the style to that of rough woodcuts in daily papers, *Allison*, 4289, 4382-6. Complains that plans of the same town are not always to be obtained alike, *Stanford*, 2369 *et seq.*

See PHOTO-ZINCOGRAPHY.

T

TEN-MILE MAP:

General criticism on, *Crook*, 1443-8, and see *Wilson*, p. 221.

THIN TOUGH PAPER:

1. *General.*
2. *Whether an edition of the 1-inch map should be published on thin tough paper.*
3. *Whether an edition of the large scale maps should be published on thin tough paper.*

1. *General.*
Few people like maps on thin tough paper; there is no general demand for them, *Wilson*, 518, 5703.

99 per cent. of the British public who use maps use them to write or scratch out on; this is impossible on a thin Manila paper, *Wyld*, 2072-3. It is not desirable to publish editions of maps on thin paper, *Leach*, 4048, 4056.

Maps on thin tough paper might prove useful for the general public, *Leane*, 3820; Appendix XVII.

For a small extra charge the Department supplies special copies of maps printed on thin tough paper, *Wilson*, 528-530, 575-7; *Johnston*, Major, 1512. It is very difficult to mount maps on a very thin Manila paper, *Wyld*, 2075.

2. Whether an edition of the 1-inch map should be published on thin tough paper.

Suggests an edition on a thin Manila paper like that used for the *carte vicinale*, *Bartholomew*, 1873-6. Does not think the paper used for the *carte vicinale* is good enough for our 1-inch map, *Stanford*, 2640. Asks for a folded edition of the 1-inch map on any thin tough paper, *Freshfield*, 4809; *Galton*, 4569.

3. Whether an edition of the large scale maps should be published on thin tough paper.

Would be very useful for attaching to leases, *Fuller*, 4164 *et seq.* Would be useful for binding up with deeds and for work in the Land Registry Office. *Brickdale*, 5946-52. It would be useful, and tend to increase the sale of maps, *Wheler*, 2322-35.

Thin paper is not required for the 25-inch map, *Stanford*, 2448-9.

TILL, Mr. W. S. (Analysis of his Evidence.)

Is the city surveyor of Birmingham, 3233.

In 1850 the town commenced a survey of their own, but it was allowed to drop, because they did not care to spend the money for it, 3234-5. Considers the town map lately issued by the Ordnance a very good one, 3237. He is not revising it, hopes the Department will do that, 3238.

If the minor detail were omitted and the map confined to the main features, it would be easier of revision and sufficient for his purpose, 3256. Would like ventilators shown, but does not care for lamp-posts or detail of gardens, 3246-53.

Remarks as to how far local authorities can assist revision by sending in tracings of the Ordnance maps showing approved alterations once a year to the Ordnance Survey Office, 3257 *et seq.* Plans sent in should not be accepted without examination, 3265, 3275. There would be very great difficulty in compelling builders to send in their plans on the 10-foot scale to the local authorities, 3270-1, 3301-6. Does not think there would be any hardship in putting a legal obligation on local authorities to send in plans of alterations to the Ordnance Survey, 3273-4. Discussion as to advisability of starting local revision centres of the Ordnance Survey, to work in connection with the local authorities, 3311-26. If the survey of suburbs not extended by the Department, it would be a great advantage to have the minor triangulation fixed, 3283-6.

Asks for a combined 6-inch map of the town and district, 3293-4. Prefers the 10-foot to the 5-foot scale, 3297-9. Considers the prices charged for extra surveys reasonable, 3327-30.

Would prefer a single edition of town plans hatched, to two editions, uncoloured and coloured 3334-9. Thinks revision every five years would be adequate, 3340.

The number of levels marked on the 10-foot map is sufficient, 3344. Would like to see more contours on the 6-inch map in flat districts, 3344-7.

The character of the 6-inch photo-zinc map is perfectly satisfactory, 3349-51. Thinks there might be a large sale of the 6-inch and 1-inch maps, but not of the large scales, 3358-9.

Does not consider boundaries of much importance to the public, 3361. Would not press that alterations to boundaries, should be shown at once on plans, 3362.

TOMES, Mr. C. (Analysis of his Evidence.)

Is borough surveyor of Eastbourne.

Had no difficulty in settling the extent of the town survey with the Department, 4509. Has kept up the map himself in the style of the Ordnance Survey, taking his own trigonometrical observations, 4512-6, 4534.

Thinks it would be a good thing if there was a legal obligation on town authorities to submit to the Department every year tracings of alterations on the scale of the Ordnance map, 4519 *et seq.* What the

cost of this would be, 4542. Thinks the nation as a whole has very little interest in the 10-foot plans and so the municipality might well bear part at least of the cost of revision, 4528-31.

Thinks there is a good deal too much detail in the 10-foot plans, all the detail of gardens should be omitted, 4544-6.

One form of map cross-hatched is all that is really necessary, 4547-51. Does not think the present hatching is too heavy, 4552-4. Approves of the black shaded line to buildings, 4555-8.

TOWN PLANS:

As to whether the shaded line to buildings is desirable.

Approve of, *Ryde*, 4412-3; *Tomes*, 4555-8; *Johnston*, Major, 4567-8; *Crook*, 994.

Objects to, *Allison*, 4340-3.

See DETAIL; PAPER; PRICES OF MAPS; STYLE OF MAPS; TOWN SURVEYS.

TOWN SURVEYS:

Most towns are on the 1/500 scale, but London being such a large place, engineers preferred to retain the 5-foot scale, *Wilson*, 51.

As to whether the 10-foot or 5-foot scale is more suitable for town surveys, see *Morham*, 3093-9; *Murray*, 3123-7; *Leane*, 3701-8; *Broom*, 4137-8; *Allison*, 4289.

The Treasury definition of a "town" is a town of 4,000 inhabitants; it is difficult now to say where a town ends and the country begins, *Wilson*, 178. A fresh definition of a "town" is much needed, *ib.*, 5802. As to the manner in which the limits of town surveys are decided, *ib.*, 180. Complains of the way in which the Department interprets the Treasury orders for the survey of towns, *Crook*, 863-95. The large scale is required most on the fringe of great towns, *ib.*, 895, 897, 908-10. The Department and borough surveyors' look upon this question from an entirely different point of view, the former considers its work is rather to survey streets and buildings after they have been made, *Wilson*, 322.

Contributions made by towns for extra surveys.

In some cases towns pay for extra surveys, *Wilson*, 179. The price paid for extra surveys in Birmingham is reasonable, *Till*, 3327-9. The town of St. Helens paid for extra surveys, *Broom*, 4075-7. In certain cases in India towns have contributed a portion of the cost of their surveys, *Walker*, 5422.

TREES:

Whether they should be shown on the Ordnance maps.

See DETAIL.

TRIANGULATION:

Explanation of the system of the triangulation of the Ordnance Survey, *Wilson*, 93.

Extended triangulation could be supplied to the local authorities for the growing districts round towns, *Wilson*, 5794. It would be useful to have this, *Murray*, 3195-9; *Till*, 3283-6; *Broom*, 4100-1; *Allison*, 4330, 4336. Skeleton plans could also be supplied for a small additional expense, *Wilson*, 5794-800.

Takes his own trigonometrical observations for extending his town survey, *Tomes*, 4515-6.

See REVISION.

TWENTY-FIVE INCH MAP:

Reason why the 25-inch re-survey of Ireland has been started, *Wilson*, 5867 *et seq.*, p. 219, and *Crook*, 72-95.

See COMPLETION OF SURVEY; LAND REGISTRATION; LAND VALUATION; PAPER; PRICES OF MAPS.

UNIFORMITY:

One of the great blots of the Ordnance system is that one system of producing anything is not adhered to for any long period, *Crook*, 1054.

It is scarcely reasonable to complain that maps are bad because of changes in style, unless the change is to an inferior style, which is scarcely probable, *Walker*, 5180.

See PAPER; STYLE OF MAPS.

W.

WALKER, GENERAL J. T., C.B., F.R.S. (Analysis of his Evidence.)

Was Surveyor-General of India for five years and 22 years Superintendent of the Great Trigonometrical Survey, 5374.

Thinks the maps of the Ordnance Survey are generally much superior to those of the Indian or Foreign Governments, 5377. As regards accuracy of topographical delineation, no method can be better than that of the Ordnance Survey, *ib*.

Thinks that the Ordnance should produce maps on a smaller scale than the 1-inch, *ib*. Thinks the new 4-mile map is a very good and well-executed map as far as it goes, 5377-9. It should be completed by having the hills engraved, 5377.

As to the extent to which India is surveyed cadastrally, 5881-2, 5397-9, 5410. All the cadastral maps are photo-zincographed, 5383. There is a very small demand for them, 5427.

Notes on the cost of the Indian Survey, 5388. The 1-inch map of India is all engraved, 5390-2.

Points out that survey work proceeds in India much more rapidly than in England, because there is less detail, the work is more roughly done, and labour is cheaper, 5385-7, 5393-6, 5407. Comparison of the Indian and English methods of surveying, 5400-2; 5424-5. In England all the field measurements are entered in a book and fitted into the triangulation, in India there is plane table work plotted on the spot, 5402.

States the scales on which Indian towns are surveyed, 5415-9. In certain cases the municipalities have paid a portion of the cost of their surveys, 5422-3.

The 1-inch map of India is entirely produced by photo-lithography or lithography, 5428. Describes the advantages of the process of photo-zincography, 5435-6. The disadvantage of photo-zinc work is that it can only reproduce drawings in lines, 5480. Thinks that complaints of maps produced by this process are most unreasonable, 5480. Compares the merits of zinc and litho work; has seen some very good results from zinc, 5437-8.

There has been very little contouring done in India, 5443-8. Considers the style of the Ordnance 1-inch map very perfect, 5451-2. Thinks that contoured maps are very serviceable to engineers, but for the general public hill-shading is indispensable, 5454-5. Thinks that it is preferable to print hills in colour, 5459-62. Describes the Indian methods of reproducing hills, 5430-1. Thinks the most perfect method is by brush-work or mezzotint between the contours like one of the Norwegian maps, 5463-6.

A systematic method for constant revision is absolutely necessary, 5467. The dates on which the field work was completed should be shown on each map and on the indexes, *ib*, 5480.

The price of some of the engraved maps and all the photo-zinc maps should be reduced, 5467. A cheap edition of the 1-inch map should be produced from zinc, *ib*. The commission to the agent on coloured and uncoloured impressions should be the same, *ib*.

Suggests that contours be inserted at 25 feet intervals up to a height of 500 feet, and at 50 feet above this up to 1,000 feet, *ib*.

Describes the difficulty of ensuring accuracy of registration with colour printing, 5456-8. Thinks it is the business of the Survey to produce the best and most accurate maps rather than to cater for the fanciful requirements of the public, who, it is highly probable, would prefer maps printed in many colours, 5457, 5467. The production of cheap colour maps should be left to private firms, 5467.

Considers that it is too late to adopt any different system of meridians, *ib*. Describes the system of meridians adopted in India, *ib*.

It is most unreasonable to complain that maps are bad because of changes in the style of production, 5480. The detail to be shown in maps is largely a matter of opinion, the requirements of good readers should not be sacrificed to those of the bad ones, *ib*. Thinks that the tabular statements of areas should not be printed on the 6-inch index, *ib*.

Suggests that, pending the completion of the hill engraved maps, it would be an advantage to produce hills by some process of heliogravure, 5480, 5499-5501.

Suggests that combined maps should be published on the 1-inch scale, 5480. That soundings of the coast should be inserted from charts, *ib*. That to remedy the difficulty in obtaining maps, the number of agents should be largely increased, and that maps should be exhibited at the different post offices, *ib*.

WANT OF KNOWLEDGE ABOUT THE SURVEY

See SALE OF MAPS.

WELSH NAMES:

See NAMES.

WHARTON, Captain W. J. L., R.N., Hydrographer to the Admiralty. (Analysis of his Evidence.)

There would be no difficulty in supplying the necessary information to the Ordnance Survey to enable them to insert coast soundings on their plans, 4945-9. Thinks it highly desirable that a certain number of soundings should be shown, 5004-11. The Admiralty cannot undertake the sounding of lakes, 5012-8.

Describes to what extent the Ordnance maps are utilised in preparing charts, 4957-64. Thinks that the present relations between the Ordnance and the Admiralty are all that can be desired, 5040-1. Occasionally supplies the Ordnance Office with their original maps for revising the low-water lines, 4949-50.

Describes the arrangements for the engraving and publication of the charts, 4965-89, 5042-5. And the system of correcting them, 5021-7. States the amount voted in the Estimates for printing and engraving, 5032-38. Gives the approximate time and cost of engraving an ordinary chart, 5087-90. It would be quite impossible to employ the Ordnance Survey to do their printing, 5046.

Has had a good deal of difficulty with the Stationery Office in obtaining suitable paper, but for the last 12 months the supply has been satisfactory, 4990 *et seq*.

Describes the terms of their contract with the agent for the sale of charts, 5047 *et seq*. Their agent gets 44 per cent., the Ordnance agent only 33 per cent.; does not consider the latter sum a sufficient inducement for him to push the sale of maps in the country, 5048, 5059. Their agent and sub-agents are allowed to return cancelled sheets, 5055. As to the profit on the sale of charts, 5063-6. Explains the proportion of the cost of production charged against the selling price of charts, 5067-71.

Hopes that the 6-inch sheets will eventually be engraved, 5082.

The want of revision of the Ordnance maps causes considerable inconvenience in making their surveys, 5084.

Would like whole instead of quarter-sheets for the 1-inch and 6-inch maps, 5084-6.

WHEELER, Mr. E. G., Commissioner to the Duke of Northumberland. (Analysis of his Evidence.)

Has used the 25-inch maps very considerably, 2079. Has found them wonderfully accurate, 2081-2, 2086-7, 2182. The public are insufficiently acquainted with these maps owing to their not being popularly sold, 2083-5. The old tithe maps vary very much in accuracy, 2092. Thinks there are too many different types of plans, 2094-9.

Prefers area books to having areas printed on the plans, 2103. Gives reasons for preferring area books, 2111-5. Would like to have both area books and areas printed on the plan, 2116. Discussion as to the numbering of areas, 2117-27. Thinks that to discontinue the numbering of areas would be a great loss, 2127. Sees no objection to numbering by sheets instead of by parishes, 2129-31. It is very desirable if practicable to show the areas of smaller divisions in villages, 2163-3.

Objects to hedgerow timber being shown, would only show important isolated trees and woods, 2185-60. It is unnecessary to show the detail of gardens, 2169-76.

The 25-inch map is generally used by land agents in his district for buying and selling land, 2178-81. It would be a great convenience if the 6-inch map were numbered, 2183-90.

The number of contours on the 6-inch is sufficient for his purposes, 2192. Both contours and bench-marks are valuable to him, 2204-5. Would not care for contours printed in colour, thinks they are quite clear enough in black, 2198-2203.

It is desirable to print a key to conventional signs on the margin of the maps, 2210-2.

Indexes are not generally known to the public, they should be shown in public places, 2218-24. It is desirable that there should be separate indexes for each scale, 2223. It takes some days to get maps from his stationer, 2229-33. Draws attention to the absence of a table for converting decimals into roods and perches, 2234-6.

Thinks the Survey is wise not to deal with the questions of rights of way and boundaries of private property, 2238-45.

Has found a good many instances of wrong spelling of names, 2250-3; see *Wilson*, p. 221. Thinks that the vernacular spelling should not be recognised; is not in favour of the national map being used to keep up the dialects of each county, 2255-9.

It would be a convenience to the public if the 25-inch maps were published in quarter-sheets, 2260-3.

Discussion as to how far local surveyors can carry out or assist the Survey to carry out the work of revision, 2269-2302. Hopes that the Ordnance maps may not be allowed to become useless through false economy in refusing sufficient money to keep them properly revised, 2289. Any scheme for compulsory land registration must necessarily depend upon a proper and regular revision of the Survey, 2367. Remarks on how far corrections to plans by local surveyors are accurate enough for defining property in deeds, 2348-60.

Has never hesitated to accept boundaries as accurate, but has found one important and some smaller errors, 2086, 2303-8, 2366-7.

Objects to hill-shading, as confusing the map; prefers a contoured map, 2309 *et seq.* Thinks the new photo-zinco 1-inch a very useful map for some purposes, 2318-9.

Suggests that all maps be published on thin strong paper or cloth, as well as on the present paper, 2322-35.

Sees no objection to doing away with coloured and uncoloured impressions and having all maps hatched, as light as possible, 2336-47.

WILKINSON, Mr. S. (Analysis of his Evidence.)

Has devoted a good deal of attention to the 6-inch and smaller scale maps from a military point of view, 4572-3.

Complains of the insufficiency of the contours on the present 6-inch map, 4575-7, 4582-3. The 6-inch maps of Yorkshire and Lancashire with 25-foot contours show the features of the ground quite sufficiently, 4574. Complains that contours, as now printed, are illegible, thinks they should be printed in colour, 4578-81. The vertical interval between the contours should depend on the character of the country and the purpose for which the map is intended, 4585, 4595, 4603-8. Would not suggest many more instrumental contours, 4587.

Would be satisfied with the conventional representation of trees on the 6-inch map, 4596 *et seq.*

Complains that the 1-inch map is not up to date and does not give a representation of the ground, 4609 *et seq.* Explains the different principles of hill-shading and praises the style of Dufour's Swiss map and the old 1-inch map, 4610, 4637-41. Asks that the method of representing ground in hill-shaded maps be fully explained in a handbook, 4615-8 4642-5. Thinks it is very desirable that hills, should be rendered in a different colour from the other features, 4619. Prefers hills in brown to black, 4620-3. Praises the French Staff map of Algeria and explains the method of showing hills by tinting between the contours, 4629-32. Produces a map of the suppressed survey of France which he thinks the most beautiful map in existence, 4634-6.

Suggests that the process of heliogravure be substituted for hill engraving, 4648. States that the process, according to Dr. Petermann's calculations, is five times as quick and one-fourth the cost of engraving, and produces substantially the same result, 4648-51.

More precision in the specification of the character of roads is desirable, 4653-8. Does not think there are too many footpaths shown on the 1-inch map, 4659. As to the most suitable scale for maps for military purposes, 4663-8.

Produces various foreign maps for comparison with the 4-mile and 10-mile maps, 4669-76.

WILLIAMS, Mr. G. J., F.G.S. (Analysis of his Evidence.)

Is a schoolmaster residing at Blaenau, Festiniog, and a Fellow of the Geological Society, 5575-7.

Produces a list of inaccuracies in the place-names in Sheet XI., Merioneth, and gives explanations thereon 5578 *et seq.* Points out a case where old lead and iron works are described as slate works, 5600. Such errors are caused by the ignorance of the surveyors who could not speak Welsh, 5601-3. Complains of the indiscriminate use of hyphens and capital letters in place-names, 5603. Gives a list of omissions of names in various sheets, 5605-6.

Makes suggestions for carrying out a revision of Welsh names, 5607 *et seq.* That some suitable person be appointed to collect names in each district, 5607-11. One person could not collect the names for the whole country as he must have local knowledge, 5605, 5607. That the person so appointed be authorised to employ old inhabitants or shepherds to assist him, 5611. That words be written in the literary form, unless there is any doubt, when they should be written phonetically, *ib.* That some well-qualified person be appointed to revise the names for each district, and that they should be supplied with a memorandum as to general principles, 5611-2.

Thinks it essential that all parties of surveyors should be accompanied by someone able to speak Welsh, 5614-7. Opinion as to whether all sheets will have to be gone over and corrected, 5618.

Asks for contours at 100 feet interval to be continued right up to the tops of hills, 5618-26. Would like to have contours printed in colour, 5626.

Asks that small streams and rocks should be shown with more minuteness and accuracy, 5626-34. States that many of these are not marked and others are incorrect, but generally speaking streams are properly shown, 5635 *et seq.*

WILSON, COLONEL SIR C., K.C.B., K.C.M.G., &c.
R.E. (Analysis of his Evidence.)

Appointed Director-General November 1886, 1.

Gives a short history of the survey, 2 *et seq.* The survey commenced in 1784, 3. Surveyors transferred to Ireland 1824, to survey on 6-inch scale for land valuation, *ib.* Survey of northern counties of England and part of Scotland commenced on 6-inch scale in 1840, 4. In 1851 Select Committee of House reported that 6-inch survey in Scotland should be abandoned, 6. Circulars issued by Treasury inviting opinions as to proper scales, *ib.* Treasury Minute 18th May 1855 orders that uncultivated districts be drawn on 6-inch scale, cultivated districts on 1/2500 scale, and towns on 1/500 scale, *ib.* Approval by Select Committee of House in 1856 of scales recommended by Treasury Minute, 9. Treasury Minute 25th November 1856 directs reduction of 1/2500 plans to 6-inch scale, and their separate publication, *ib.* Division in House in 1856 favourable, and in 1857 unfavourable, to 1/2500 scale, *ib.* Royal Commission on Survey appointed 24th December 1857, reports 20th May 1858, *ib.* Refers to measures contemplated for using plans for land registration and local assessment, 10-14. Consequent on report of Royal Commission, Treasury Minute 11th September 1858 directs that survey be carried on in accordance with Minutes of 18th May 1855 and 25th November 1856, 14. Survey is now carried on under these Minutes, with certain modifications, 18, 19. In 1862 Select Committee recommends that the scales laid down in these Minutes be extended to those portions already surveyed on 1-inch scale, 14.

In 1870 Survey was transferred from War Office to Office of Works, on grounds that military map was completed and future work would be cadastral, 16. In 1871 War Office wrote that, as the old 1-inch was not accurate enough, it was desirable that, as cadastral survey progresses, a new 1-inch map with hills be engraved or photo-zincographed, *ib.* Treasury, 4th July 1872, orders that a new 1-inch map in outline be reduced from the cadastral survey, and engraved; that electrotypes be taken, and then hills be engraved on original outline plates, *ib.*

Office of Works gives discretion to Director to postpone the engraving of the hills, *ib.*, 21, 25. Having to await the completion of the cadastral survey is the reason for the delay in producing the 1-inch outline map, 24, 93, 116. Reasons for the delay in producing the 1-inch map with hills, 24-6.

Return of amount of vote for surveys from 1858 to 1892, 26-9. Special funds were granted for completing the cadastral survey by 1890, 30-42. Revision of Lancashire and Yorkshire authorised 22nd December 1886, 44. This is the only revision which has taken place up to date; it is practically a new survey, 48. Distribution of expenditure from 1880-91, 45-7, App. XIV.

Instructions now exist for survey of whole three kingdoms on 1/2500 scale, with reductions to 6-inch and 1-inch scales, 49, 50. Most towns are on the 1/500 scale, London, being so large, is on the 5-foot scale, 51, 52. All England, except uncultivated districts and Lancashire and Yorkshire, has been published on the 1/2500 scale, the latter will probably be completed in 1895, 60-1, 70. The old series 1-inch map of the whole of England was completed in 1870, 62. That included the new series maps of northern counties which were never published on the old system, 62-5. Extent of new series in outline, and with hills, published to date, 67. The whole of the United Kingdom has been published on the 6-inch scale, 69, 74, 78. Whole of Scotland and Ireland is published on the 1-inch scale in outline, 75, 81. Extent of these countries published on 1-inch scale with hills, and on 1/2500 scale, 75-6, 79, 80, 82. The public buy more 1-inch maps in outline than with hills, 83-6, 208, 213.

Describes the English system of triangulation, 93. Explains the difference between the English and foreign systems of surveying, 93-4, 102-6, 126-30. With us one department carries on all the work; elsewhere one department conducts the triangulation, another the cadastral survey, and another the topographical survey, 93. The *cadastre* in all foreign countries is made locally, and has the defects of our old tithe maps, *ib.*, 94. An enormous number of maps and plans are published with us, 94, 98. Cadastral maps are not published abroad, 94, 101. They are kept in manuscript, and tracings supplied on payment, 107-110. Foreign maps are perfectly accurate for practical purposes, 102-6, 125. Definition of the term "cadastre," 120-3. Remarks on the Indian system of surveying, 131-6.

The 1-inch map has never been revised, but new railways have been inserted, 137-9. One special map only of Brighton has been revised, 140-1. Some of the old 1-inch map is very good, some very bad, 142-4. The whole of the 1-inch map in outline will be engraved by 1896, 147. Advanced edition by photo-zincography, except for Yorkshire and Lancashire, will be completed this year, 158-9, 168. Dates of cadastral surveys, from which the 1-inch maps are made, 150-6, 244-7, App. V. The hills will be completed by engraving or photo-zincography by 1900, 161-4, 210-1. The whole of them will be engraved by 1910, 218-9. Photo-zincographed map not to be compared with engraved map, 169.

The great number of town plans has delayed rest of cadastral work, 165-7, 177, 181-4. Towns of over 4,000 inhabitants are entitled to 1/500 scale, 178. Local contributions are sometimes received from towns for additional surveys on this scale, 179. How the limits of the large-scale plans are settled, 180.

Output of the 1-inch map increased enormously after completion of cadastral survey, 185-7, p. 227-8. Great difficulty in getting engravers, 193, 198-9, 220, 248-9. Does not recommend the adoption of the heliogravure process for producing hills, 202-3, 250, p. 225.

It would take 10 years and cost \$5,000 a year in addition to present vote to revise the whole country to the 15-year limit, 221-4. Points out the difficulty and expense of re-publishing revised plans, this is the root of the revision question, 97, 225-37. Advocates that the revision of the 1-inch map be kept quite distinct from that of the cadastral survey, 239-40. The former is not a heavy undertaking, 242. Want of engravers has prevented this work being already started, 243. Scheme for revision of cadastral survey, 241, 267-8. Publication of 1-inch map is always four or five years after completion of cadastral survey, 251-6. Legislation compelling surveyors to send in reports of alterations would be advantageous, 257. Would not care to accept plans of alterations without examination on the ground, 258-64. Small corrections sent in by the public are accepted if thought to be accurate, 274-8. Suggests that surveyors should be obliged to give notice of changes, annually, in the shape of a rough correction of the map, 279-85.

Ireland is treated as a distinct branch of the Survey, 269-73.

Labour of showing alterations to boundaries on plans will be enormous, 286-91. Why parcels are numbered by parishes and not by sheets, 292-5. It would greatly simplify the work of the Survey if parcels were numbered by sheets, 296-7. The Irish system of numbering is a very perfect one, 299. Necessity of re-numbering parcels explained, 301-4.

The cost of survey is increasing slightly, 306. Cost of subsequent revision after the 15 year limit is reached, 309-10. Reproduction of manuscripts, and survey of Palestine has not delayed work of the Survey, 311-3.

Revision of suburban lands will be taken up first, 317-8. Suggests revision of towns every five years, and of agricultural districts every 15 or 20 years, 319. Borough surveyors wish to have agricultural land on the outskirts of their towns surveyed on the large scale, the Ordnance consider this waste of money, 322. No hope of any revision of published plans for four or five years, until the Scotch counties are done, 331-2.

Letter from Sir J. Dorington to Mr. Chaplin, of 29th May 1891, propounding a scheme for revision, 334.

Would propose at once to appropriate a portion of Survey Vote to revision of 1-inch map, slightly checking 1/2500 work, 335-41. The expense would not be very heavy, 342. Cost already partly provided for, 343-4. Hitherto it has been considered that the Survey Vote should first be applied to production of 1/2500 maps, where not already existing, 341.

At present rate of expenditure cadastral survey of England and Scotland will be finished in about five years, of Ireland in about 25 years, 345-50. Estimate of the cost of revision to 15-year limit for each year from 1892 to 1902, 355-62, App. C. After 1902 surveyors could be employed on the 25-inch resurvey of Ireland, 363-4. Whatever funds available, revision could not be finished much before 1902, 365-9.

Treasury gave 1,135*l.* for completing the whole of the advanced edition of the 1-inch map, 374-7. These maps are based on a survey of about five years ago, 382.

The Department has nothing to do with the advertisement or sale of maps, 384-7. The term "publication" means that the map has been notified to the agent for sale, 385-6.

Great destruction of bench-marks has been found on revision, 387, 408-14. Necessity for protection of, by legislation, as is done in foreign countries, 387-9. Bench-marks are placed on most permanent objects to be found, 393-4, 402-3. Department has the right to do this, 465. Description of bench-marks, 395-7. Erection of special stones for bench-marks not recommended, 398-401, 404. There are three bench-marks to every mile of levelling, 404-7.

Receives suggestions of a very different nature as to style of 1/2500 maps, 415. This map was engraved before the invention of zincography, 416. Remarks as to insertion of trees, some people do not like trees, others think they are an improvement, 419-22. Rules of Survey as to showing trees explained, 423-9. All brickwork and masonry is coloured red, 430-1. Plans are sold plain and coloured, 433. They are hand-coloured, because the sale is not sufficient to make colour-printing pay, 436-7. There is a strong feeling against colouring, 437, 458. Hatched maps are very much cheaper than coloured ones, 459-60.

Footpaths—the instructions are that all permanent paths are to be shown without inquiry, 438-9, 447-9. Impossible for Survey to inquire into questions of rights of way or property boundaries, 440-6. Unfenced roads are shown by two dotted lines, 451.

It is difficult to find room for a key to conventional signs on plans, 452-7, 555, 579-82. Levels are inserted on roads in accordance with recommendation of contouring committee, 462-4.

Errors in areas are in nearly every case printer's errors, when pointed out, they are at once corrected, 466-8. Very few complaints of such errors are received, 469. It is impossible for the Survey to inquire locally as to the bracing of areas, 470-4.

Maps showing boundaries are exhibited to the public before completion, 475-9. It would cause very great delay to exhibit the detail maps in the same manner, 480.

Describes method of obtaining place-names, 481-3. Every name on the Ordnance Survey maps is given upon three authorities, 481. Welsh names were all submitted to a Mr. Rowland, a reputed good Welsh scholar, 484. In Scotland received assistance from Gaelic scholars, 485. Irish names were collected by one of the best Irish scholars of the time, 488. Double names for parishes are sometimes given, 486-7.

History of the 6-inch map, 493 *et seq.* Originally published as a county map, and engraved, 493. Why photo-zincograph process was introduced, *ib.*, 497.

Great saving of time and money effected by this, 507-8. 22 counties are engraved and 30 photo-zincographed, 496. Northern parts of Lancashire and Yorkshire are being revised on the copper-plates, 467. Engraving of 6-inch has ceased, except for revised work where plates can be altered, 502-5. Photo-zincography gives a good practical map in a very short time, 506.

Reason why there are two kinds of paper used for 6-inch photo-zinc map, 514-5. Special sheets of the same kind of paper are supplied for mounting purposes, 515-6. Thin tough paper has been tried, but few people liked it, 518. Department is prepared to supply special copies of maps on thin paper, 528-30, 575-7.

Experiments have been tried in printing contours in colour, 531. It is more expensive on account of the double printing, 534. If cost no objection, would prefer to print contours in colour, 551-2.

Considers the 6-inch engraved map cheap, 537. Thinks the photo-zincographed 6-inch map might be cheapened, 538. It is dearer than the engraved map for equal areas, 538-41. Reason of this, 542-5. Reason why the photo-zinc 6-inch map is only quarter the size of engraved 6-inch, 546-50. Explains why there is a contoured and uncountoured edition of 6-inch map, 553.

Contours are now inserted in accordance with the recommendations of the Contour Committee, which reported 20th July 1854, 6, 556. Very large expense of increasing number of contours, 557-9, 571-3. Interpolated contours were discontinued on the advice of Brunel and other engineers of the day, 561. Meaning of the term "instrumental contouring," 564. How they are distinguished, 566. As to altitudes of contours inserted at different dates, 565, App. XII.

Combined maps can be produced without difficulty, 583. The production of these has only just been started owing to pressure of other work, 583-5.

It has not been considered the work of the Survey to take soundings of lakes, 589. The work would be better carried out by the Admiralty staff, 591-3. This ought to be done to complete the maps, 594-5.

The 1-inch map is cheap at 1s., 597. Has suggested a cheap edition by transfer to zinc, *ib.* Statement of the prices of maps since 1866, 599-601. The price is based on the cost of production, 602-5. Explains how the large-scale maps came to be published, 606. Enormous number of maps in store at Southampton, which will have to be condemned when revision takes place, 607-9. The demand for maps is very unequal, 612-9. Observations on the profit on sale of maps, 610, 621-5.

There are not so many names on the 1-inch maps as there used to be, 626-8. Describes how the names are selected for insertion, 629-32. Describes the present system of preparing the 1-inch map, 632-4. If revision of 1-inch were commenced at once, it could be completed by 1896, 641. Only instrumental contours are shown on the 1-inch map, 650.

Experiments have been made of printing hills in colour, 652. Personally prefers black to colour, 656-7. Every foreign country has a map printed in black, with hills in black, and in addition other scales in colour, *ib.* Hills shown with zones of colour make useful maps for scientific purposes, 654. Quotes memorandum by Sir C. Trevelyan that the production of special maps suited to the public taste should be left to private firms, 660. What private firms have done in this respect, 660, 662.

The question of copyright rests with the Stationery Office, who hardly ever interfere, 661, 663. Considers that actual reproductions of Ordnance maps should not be allowed, 664-8.

History of the publication of 4-mile map, 670 *et seq.* It was commenced in 1859, 670. Work stopped in 1872 when new 1-inch map authorised, *ib.* Resumed in 1884 at request of Director of Geological Survey, *ib.* Transfers were asked for by Mr. Stanford, and to avoid publishing the maps in fragments, determined to issue it for sale with its known imperfections, *ib.*, 681. Cost of engraving was charged to Geological Survey, 670-1. Only features revised were the railways, 670. It was issued as an old map, 671. Not able to thoroughly revise the map until the new 1-inch map is finished, 671. It is proposed to go on with the hills when engravers are available, 677. Describes the uses the 4-mile map of Ireland is put to, 679, 685. The hills on this map are produced by triotint, 687-92.

Second Examination.—Observations on the revision of the 1-inch map, 5650-80. Proposes to form a separate revision section to carry out the work, 5650-1. The revision could be completed in five years at a cost of about 2,000*l.* a year in addition to the present expenditure of 1,500*l.* a year, 5653-7. In Ireland the revision of the 1-inch map has been authorised a great number of years, 5658. Experience has shown that there have been very few alterations in roads, 5659-66. Estimate for completing the revision of the 1-inch map by 1896, 5668-70, App. B. Cost of subsequent revision, 5658, 5672. This is contingent on public departments sending information as regards railways, roads, canals, and docks, 5673-5, 5679-80. Describes the system adopted in Prussia for the revision of the staff maps, 5676-9.

The 1-inch maps are printed as required, no large stock is kept, 5681-4. Thinks that the production of cheap colour maps should be left to the trade, 5685-6. States the views of the Military Committee with regard to producing a map in colour, 5688-90. Thinks that the 1-inch map with hills might be printed in two forms, with black hills and with brown hills, until the taste of the public is ascertained, 5691-2. There is no difficulty in printing maps on thin paper, but there has never been any demand for them, 5702-3. Extra cost of 6-inch map if contours printed in colour, 5704-15.

It would be a very great misfortune to give up the present hill-engraved map in its present form, 5719-21.

Observations on paper, 5722-35. There should be a standard paper for each scale, 5723, 5734. Suggests that a contract be made with one firm for 10 or 15 years, 5725. From the Survey point of view it is desirable that the Director-General should deal direct with paper dealers, 5726, 5732. For the last three or four years the paper supplied by the Stationery Office has been satisfactory, 5727-9. It is difficult to use the same paper for printing from copper and zinc, 5733.

Cost of instrumental contours as recommended by Military Committee would be about 4*l.* per square mile, 5737-9. Reason why system of contouring in Yorkshire and Lancashire was abandoned, 5743-8, 5751. Captain Gosset's original estimate of the cost of contouring was much under-estimated, 5750. Contouring in Ireland was stopped in 1857, 5747. Has been lately recommenced, 5751. Uncountoured edition of 6-inch map is to be sold out at reduced price of 8*d.*, 5752-3. Real reasons why agent objects to arrangement, 5753. Explanation of why some plans of Gloucester are published with houses in black and some hatched, 5758-9.

Observations on meridians, 5760-3. Formerly each county was drawn on its own meridian, so that the map of each county should be complete in itself, 5760. During the later years of the Survey as many counties as possible were drawn on the same meridian, *ib.* The cost of altering the meridians would be enormous, *ib.* Has very rarely heard any complaints as to difference of meridian, *ib.* There is no serious difficulty in combining sheets, 5762-3. Is diminishing the number of meridians for Scotland, 5761.

70,000*l.* a year is now being spent on the revision of Yorkshire and Lancashire, and 26,000*l.* on revision of London, and other large towns, 5764-78. Comparison of cost of surveying towns on 1/500 and 1/2500 scales, 5780-90, App. XV.

Department could supply towns with triangulations or skeleton plans of growing suburban districts, 5794-5800.

The great difficulty of revision is not the revision of the manuscript plans, but the publication of revised editions of the plans, 5791, 5801. Suggests that revised editions be only published at the cost of the towns, 5801. Asks for a new definition of the word "town," 5802.

Points out that the very high price of coloured plans is largely due to the system of agency, 5803-4, 5834-5. Describes how the price of coloured plans is calculated, 5814-5. Agent does not keep uncoloured maps, because it is his interest to push the sale of coloured maps, 5806-7. It is difficult to make hatching finer, 5812. The editions of 1/500 plans are about 45, of 1/2500 plans 35 to 50, these are far too small to make colour-printing pay, 5816-20, 5827-31. Private firms print editions of several hundreds, their conditions are entirely different, 5820. Return of what work is included in the cost of publication of the

-different plans, 5821-5, App. IX. Price at which a close town plan on 1/2500 scale with houses hatched could be produced, 5826, App. XVI.

The alteration to boundaries has been very extensive, 5838-42. The expense of publishing at once new editions showing alterations would be enormous, 5836. Suggests that this be deferred till the periodical revision, 5836. 5843. Suggests that arrangements might be made with county councils for joint revision of boundaries, as was done in Scotland with Scotch Boundary Commission, 5844-7. Scotch boundaries are now authoritative, 5846. Department decides disputed boundaries from best information obtainable, 5848. Would be a great advantage if English boundaries were to acquire same authority as Irish boundaries, which are never disputed, 5847.

Observations on the numbering of parcels 5851-65. Parcels are not numbered at present on 25-inch maps in Ireland, 5851. From Survey point of view it would be better to omit numbers, 5853-4. Numbering by sheets would do away with the present difficulty caused by alterations of boundaries, 5857. How numbers are applied for purposes of land valuation on 6-inch maps in Ireland, 5858-62. When area books were abolished, the numbering of parcels was continued at request of the Land Department, 5865. Describes how the maps for Landed Estates Courts are used in Ireland, 5867-71. Reason why 25-inch survey was commenced in Ireland, 5867.

Discussion as to best forms of indexes, 5872-83. Separate indexes are now produced for each scale, 5875. Considers a combined index should be produced for use of engineers, 5881-2. Proposes to insert on 1-inch index the names of the towns from which the sheets take their title, 5880. Does not think the sale of indexes stops the sale of small-scale maps, 5885-8.

Details of proposal for sale of maps through the Post Office, 5889-98. How far it is possible to find room for key to conventional signs on margins of maps, 5900-4.

The system of showing unfenced roads by dotted lines is to be abolished, 5905. Considers scheme for three classes of roads a good one, 5907.

Complains that the Department has no control over the agent, 5913.

WILSON, COLONEL SIR C., K.C.B., K.C.M.G., &c., R.E. (Written memoranda.)

On alleged errors, p. 218.

On town revision, p. 223.

On revision of 1/500 and 1/2500 plans at the public cost, p. 224.

On 1-inch map, explaining distinction between old and new series maps, p. 224.

On 1-inch map, outline edition, p. 224.

On 1-inch map, hill edition, p. 225.

On the representation of hills:—

A. By a tint, p. 226.

B. By vertical hachures, p. 226.

1. Engraving, p. 226.

2. Hellogravure, p. 226-7.

Return of number of square miles of 1-inch map published in outline and with hills from 1872-91, p. 227-8.

On contours giving estimates of cost of additional, p. 228-9.

WYLD, Mr. J., Geographer to the Queen. (Analysis of his Evidence.)

Sells, after Mr. Stanford, the largest number of Ordnance maps in England, 1916.

There are constant complaints by the public of inaccuracies, 1918; see *Wilson*, p. 221. These are due to the plans being obsolete, 1943-7. Now and then original errors are found, 1919-23.

Describes a map of Fulham on a scale of 5 feet to the mile, he has just completed, and to what extent he used the Ordnance plans in producing it, 1927-42. It is cheaper to send out a man to survey than to dovetail together builders' plans, 1948-9. If such plans were sent in on Ordnance sheets it might be possible to revise from them, 1950-3. There is not the slightest difficulty in making an annual revision of town plans if the borough surveyor gives notice of alterations, 1954. If plans are kept up to date the expense of revision is slight, if they are allowed to fall into abeyance the expense is very great, 1955.

Observations on the relative advantages of hatching and colouring, 1956-76. Would like maps published in two forms, one plain, the other hatched, 1974. The individuals who require maps plain are infinitesimal in number compared with the bulk of the public, 1976.

Although it is a most difficult thing to know what to suggest, thinks that improvements might be made in the catalogue, which the public grumble at a great deal, 1979.

There ought to be an index to the 25-inch maps in counties, *ib.* And separate indexes for each scale, 1980. Complaints of the confusion which arises from the dual numbering of sheets on the county boundaries and makes suggestions, 1981-2000. The public constantly complain of the 25-inch and 6-inch indexes being combined, 2002. More names are required on the 1-inch index; it would be a good plan to let a sheet be known by the name of the chief town in it, 2008-18. Thinks indexes should all be printed in black, 2021-31. Suggests that the same map should serve for the 6-inch and 25-inch indexes, the sheet lines being changed, 2030-3. The town indexes are fairly good, 2034-5.

It was well worth while to bring out the advanced edition of the 1-inch map by photo-zincography, it is a matter of extreme importance that the survey should be completed at the earliest possible moment, 2040-1.

Modern engraving is nothing like so perfect as the engraving in the days of our grandfathers, 2045. The present engraving of the 1-inch map is fairly good, 2045-6.

Does not consider the present distinction between first and second class roads sufficient, 2049. Makes suggestions for distinguishing between roads, 2048.

Thinks a great many more names might have been usefully inserted on the 1-inch map, 2051-7.

States that 60 to 75 per cent. of the maps he sells are mounted in some form, 2060. Complains that the paper is not uniform in thickness, quality, or colour, *ib.* Describes the very great difficulty this causes in mounting maps, 2060-6. There is not the slightest difficulty in the Government procuring the same uniform quality and colour of paper every year, 2071. States that 90 per cent. of the public want to make alterations on maps; it is impossible to do this on thin paper, 2072-3. It is also very difficult to mount maps on very thin Matilla paper, 2075. Describes the requirements a good paper should fulfil, 2949. Cheap papers tear and crack, a great disadvantage, 2950. It is better to print maps on paper which all comes from one mill, 2950-2. Does not recommend the use of a cheaper paper for the Ordnance maps, 2962, 2964-5. As to whether it is possible to store paper for any length of time without deterioration, 2069, 2962-3.

The present system of retailing maps is not satisfactory to the trade or the public, 2967. Complains that he has to buy maps outright and cannot return them, 2967-77. Thinks there should be an arrangement whereby maps, not required, might be changed and obsolete maps bought back by the Department, 2990-6. This is the custom of the trade, 2997.

Thinks a new index should be sent to the trade directly it comes out, 2978. At present it can only be obtained from the agent on application, 2985. Asks that the Department should send one copy free direct to certain of the trade, 2986. Or send the weekly list of maps published, 2989.

Complains that old editions are sometimes issued by the agent instead of new ones, 3004. Thinks that the old editions ought to be cancelled and new ones supplied, the moment the new edition is issued, 3005.

Z.

ZINCOGRAPHY:

Comparison of zincography with lithography.

Has not had much experience of zinc, but thinks better work is got from stone, *Bartholomew*, 1844. Thinks litho work is better as a whole, *Johnston*, 2741-7. Litho work is very much the better of the two, *Currie*, 2855-62, 2866-70, 2894-903. Has seen some very good results from zinc, *Walker*, 5437.

BOARD OF AGRICULTURE.

ORDNANCE SURVEY.

COPY OF MINUTE

OF THE

BOARD OF AGRICULTURE

Dated the 22nd December 1893

UPON THE

REPORT OF THE DEPARTMENTAL COMMITTEE APPOINTED
BY THE BOARD OF AGRICULTURE IN APRIL 1892

TO INQUIRE INTO THE

PRESENT CONDITION OF THE ORDNANCE SURVEY.

Presented to both Houses of Parliament by Command of Her Majesty.



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COPY of MINUTE of the BOARD OF AGRICULTURE, dated the 22nd day of December 1893, upon the REPORT of the DEPARTMENTAL COMMITTEE appointed by the BOARD OF AGRICULTURE in 1892 to inquire into the present CONDITION of the ORDNANCE SURVEY.

MINUTE of the BOARD OF AGRICULTURE, dated the 22nd December 1893, upon the REPORT of the DEPARTMENTAL COMMITTEE appointed by the BOARD OF AGRICULTURE in 1892 to inquire into the present CONDITION of the ORDNANCE SURVEY.

The Board have had under consideration, in consultation with the Director-General, the report of the Departmental Committee appointed by them on the 26th April 1892, to inquire into the present condition of the Ordnance Survey, and especially to consider—

- (1.) What steps should be taken to expedite the completion and publication of the new or revised 1-inch map (with or without hill-shading) of the British Isles?
- (2.) What permanent arrangements should be made for the continuous revision and speedy publication of the maps ($\frac{1}{8000}$ (towns), 25-inch, 6-inch, and 1-inch scales)?
- (3.) Whether the maps as at present issued satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed, and price; and whether any improvement can be made in the catalogue and indexes?

I.—FIRST HEAD OF REFERENCE.

What steps should be taken to expedite the completion and publication of the new or revised 1-inch map (with or without hill-shading) of the British Isles?

The Committee consider that the outline edition of the 1-inch map, being so near completion should continue to be produced in the same way as hitherto, and they approve of the course which has been taken in producing an advanced edition by photo-zincography so as to complete the map for the whole country this year (1892). The Committee are of opinion, however, that the temporary character of the photo-zincographed edition might with advantage be more distinctly indicated on each sheet, and they propose that the word "Temporary" should be prefixed to the expression "Advanced Edition" now put on the maps.

The Board concur in this proposal. It has been adopted in the case of all photo-zincographed 1-inch maps published since the 1st January last, and effect will be given to it whenever a reprint of any sheet already published is required.

II.—SECOND HEAD OF REFERENCE.

What permanent arrangements should be made for the continuous revision and speedy publication of the maps ($\frac{1}{8000}$ (towns), 25-inch, 6-inch, and 1-inch scales)?

The Committee deal with this branch of the subject referred to them under the following heads:—

- (a.) Revision of 1-inch map.
- (b.) Revision of large-scale maps.
- (c.) Revision of the 25-inch and 6-inch maps.
- (d.) Revision of town maps.
- (e.) General remarks on revision.

(a.) Revision of 1-inch Map.

The Committee observe that the 1-inch map is the one most used by the public for general purposes, both military and civil, and they recommend strongly that its revision be carried out

at all times independently of that of the larger scales, and that whatever funds are necessary should be provided to carry out these recommendations at as early a date as possible.

The Board concur in the views thus expressed, and it was with much satisfaction that they found themselves in a position to commence the work proposed by the Committee under this head. On the 12th January last, the Lords Commissioners of Her Majesty's Treasury approved of an addition of 93 Royal Engineers to complete the strength of the survey companies, at an annual cost of 5,000*l.* for military pay, paid out of army funds, and of 2,000*l.* to the Survey Estimates for the current year, 1893-4, for the purpose of commencing the revision of the 1-inch map in outline, independently of the revision of the Cadastral Survey. Difficulties not originally foreseen have since arisen in connexion with the increase of the number of Royal Engineers employed on the Survey, but a special division of the Survey has been organised to carry out the work, which has now been begun. The Board desire that in the preparation of the Estimates for 1894-5, and in future years, the limit of time proposed for the completion of the revision should be kept steadily in view, and they trust that the necessary funds may annually be made available for the accomplishment of this important work within the period named.

The Committee further recommend that railways, roads, and conspicuous works and such other alterations as can properly be shown on the 1-inch map, should always be inserted at as early a date after their completion as possible. The Board agree, and a circular was addressed to urban and rural sanitary authorities in August last, inviting those bodies to notify to the Director-General the formation of new highways and roads and important alterations in existing highways and roads. The Board are also in communication with the Board of Trade with regard to the supply by that Department of information with regard to the opening of new tramways, harbours, docks, or piers, similar to that which has for many years past been furnished in the case of railways and railway stations.

The Committee further propose that the revision should be so arranged that the whole country should be gone over and the map brought up to date within periods of 15 years, that each map should bear the date to which it is corrected or revised, and that no map be allowed to be sold by authorised agents which bears on its face a date of publication or revision older than 15 years.

The Board agree with the Committee that no portion of so important a map as the 1-inch map ought to remain unrevised for a period longer than 15 years, but the provision to be made in the Estimates for the business of the Survey must necessarily be an annual provision, and it is not in the power of the Board, by the adoption of any fixed rule, to bind their successors to propose to the Treasury expenditure for any particular service. Moreover, some elasticity is requisite in regard to the periods within which revision should take place. Changes proceed with very much greater rapidity in some parts of the country than in others, and whilst in some districts, such as the Highlands of Scotland and the sparsely populated portions of England and Wales, revision may without much disadvantage be deferred for the full period above-named, in others, such as the manufacturing districts and the south and south-east of England, it is quite possible that revision ought not to be postponed so long.

This being the case, the Board propose that it should be a standing instruction to the Director-General that, in submitting his annual estimates of expenditure for consideration, he should make provision for the revision of the map in accordance with the recommendations of the Committee, and at the same time call the special attention of the Board to any case in which portions of the map may have remained unrevised for a period exceeding 15 years.

With regard to the suggestion that no 1-inch map should be allowed to be sold by authorised agents which bears on its face a date of publication or revision older than 15 years, the Board are not prepared to lay down a fixed rule to this effect, although they would hope that the sale of such maps will before very long take place only in rare and defensible instances.

The date of revision is always placed on revised maps, and will be placed on the revised sheets of the 1-inch maps as they are published.

(b.) *Revision of Large-Scale Maps.*

The essential recommendations of the Committee with regard to the revision of the large scale maps are made under the two heads which follow, viz., "Revision of the 25-inch and 6-inch Maps" and "Revision of Town Maps." The Committee recommend, however, under this head, that in future the term "revision" should only be applied to the bringing up to date of a map on the same scale as that on which it was originally drawn, and that "re-survey" should be the term applied to the work now in progress in Lancashire, Yorkshire, and in Scotland, as well as to the production of the 25-inch maps of Ireland.

The Board agree in the opinion thus expressed. The Director-General has adopted the term "re-survey" in the annual report of the progress of the Survey for the year 1892, and the Board will arrange, so far as it is in their power to do so, for the employment of the terms "revision" and "re-survey" in connexion with the business of the Survey, in the sense proposed by the Committee.

The Board propose at the same time to consider, in conjunction with the Treasury, whether any additional information can be supplied in the Estimates so as to secure that full information should be annually furnished to Parliament as to the nature and extent of the particular services for which provision is made, and as to the nature and extent of the work still remaining to be accomplished within the authorised programme of the Survey.

(c.) *Revision of the 25-inch and 6-inch Maps.*

The Committee point out that while the large-scale maps are excellent in quality and fully meet the purposes for which they were designed, the very largeness of the scales necessarily leads to their rapidly getting out of date, and they state that the 6-inch maps drawn between 1840 and 1850 are in some districts nearly useless, the defect being even more apparent in the 25-inch plans. The Committee further observe that they have received evidence of the great cost entailed if the plans are allowed to remain for too long a period without revision, necessitating in some cases almost re-survey, and they conclude that it is urgently necessary that the advantage of so splendid a work as these maps undoubtedly are, should not be destroyed for want of a regular system of revision.

In the opinion of the Board, the conclusions at which the Committee have arrived on this subject are in entire agreement with the facts of the case, and practically the only question presenting itself for settlement in connexion with the recommendations of the Committee is the financial one. The Director-General, in his evidence before the Committee, estimated at 630,000*l.* the additional vote required to bring Great Britain up to the 15-year limit within a period of 10 years from the 1st April 1893, the addition to the vote for 1893-4 to be 16,000*l.*, increasing to an addition of 78,000*l.* in 1897-8 and 1898-9, and thereafter diminishing to an additional charge of 20,000*l.* in 1903-4.

The report and proceedings of the Committee were received too late to enable the matter to be satisfactorily discussed in connexion with the Estimates for the current year, but it will undoubtedly be the duty of the Board to submit to the Treasury proposals on the subject prior to the settlement of the Estimates for the year 1894-5. In the event, however, of Their Lordships being unwilling to sanction such large additions to the Estimates for 1894-5 and for succeeding years, as those above proposed, it will be necessary for the Board to consider whether the importance and urgency of the work of revising the 25-inch map are not such as to render it incumbent upon them to give that work priority over services of less general utility, and in this connexion the proposals of the Committee with regard to the town maps, to which the Board will subsequently refer, are of great importance. The Board would much regret to find themselves compelled to agree to the suspension of any part of the present programme of the Survey, but it is for the Treasury to determine what must be the limits within which the expenditure must be confined, regard being had to the other demands upon the national purse, and within those limits the Board feel that preference ought to be given to those services which are most urgent and of the greatest national value.

The Committee recommend that when the maps are brought up to date, arrangements should be made for revising them every 15 years, but for the reasons stated in connexion with the proposals as to the revision of the 1-inch map, the Board cannot prescribe a fixed period within which revision should hereafter be made. The Board propose, however, that it should be a standing instruction to the Director-General to supply with the draft Estimates for each year, and also in the annual report of progress, a diagram showing the dates of the commencement and completion of the last survey of each individual county. By this means a periodical review of the position will be secured, and the Board will be enabled to determine what proposals it is necessary for them to submit to the Treasury for consideration and settlement.

(d.) *Revision of Town Maps.*

According to a Treasury Minute of the 18th May, 1855, which is still in force, all towns having more than 4,000 inhabitants are to be surveyed on the $\frac{1}{560}$ scale, *i.e.*, 10·56 feet to a mile. When this minute was issued no one could have foreseen the formidable dimensions which the town surveys would assume, the difficulties attending their publication, or the effect they would have in seriously delaying the progress of the more generally useful survey on the 25-inch scale. At present the town work which the Survey has in prospect is the revision and survey of 644,800 acres already published or taken up for survey, and the survey of 63,600 acres either in the form of extensions to old surveys or of new surveys of towns that have come within the terms of the Treasury Minute since the Cadastral Survey was completed. Owing to the steady growth of the larger towns, and the constant improvements going on in them, the town work is steadily increasing and many of the plans soon become obsolete.

In these circumstances, the Committee recommend that a change should be made "which shall have the effect of relieving the Ordnance Survey Department of the survey and revision, and likewise of the publication of the town-scale maps, and which, while leaving it the duty of supervising the maintenance of the maps, shall permit that Department to devote itself more thoroughly to the general maps."

It appears to the Board that there is much to be said in favour of the view that the production and maintenance of these large town-plans should be a local rather than a national burden. As the Committee observe, the advantage to the municipal authorities in the possession of such a map as that on the 10-foot scale is very great, but the Committee do not think that there is any corresponding advantage to the Government and to the general public, and they consider that the 25-inch maps, if kept up to date, meet every requirement from the ordinary public point of view. In the event, therefore, of the Treasury being unable to sanction the additions to the Estimates for 1894-5 and succeeding years, necessary if the town scale maps, together with the 25-inch and 6-inch maps are to be brought up to a reasonable date at an early period, the Board propose, as an alternative, to recommend that survey and publication on the 10-foot

scale be discontinued, except in those cases in which the local authorities desire the work to be done and are willing to defray the additional cost thereof, over and above the cost of survey on the 25-inch scale.

The Committee discuss in detail the arrangements to be made in order to carry out the proposal to relieve the Survey and the public of the charge and cost of maintaining the town plans, and at the same time to ensure their maintenance in future. The observations of the Committee under this head will receive very careful consideration at the hands of the Board, but at the present time it is only necessary for the Board to lay down two general principles as applicable to this matter. The Board feel that, in the first instance, the local authorities must determine for themselves whether they would wish surveys of their respective districts to be made on the 10-foot scale, and in the event of the decision being in the affirmative, and of their being willing to defray the cost of such a survey over and above that of a survey on the 25-inch scale, the Board consider that the organisation and experience of the staff of the Survey may properly be made available for the purpose, under suitable conditions. Within these lines many details will present themselves for settlement, and it will be necessary to secure the survey from irregularity and great fluctuations in the demand upon it for local work. The most important object now to be kept in view in the general interest is the proper maintenance of the cadastral maps, and the proposals of the Committee, although they entail a burden upon certain local authorities heretofore borne by the Exchequer, will undoubtedly assist materially in the speedy accomplishment of this purpose.

(e.) General Remarks on Revision.

In view of the fact that an altered boundary will often affect a large number of plans, and that the alteration will entail either new editions of those plans, or the alteration by hand of all impressions in store, as well as necessitating alterations on the smaller scale maps and in the index maps affected, the Committee recommend that alterations to boundaries be not inserted on Ordnance Survey plans until the regular revision of the district is taken up, and they propose (a) that the altered boundaries be in the first instance correctly ascertained and delineated on the maps by the Survey, (b) that the cost of ascertaining them be part of the cost incurred by the locality seeking the alteration, and (c) that the survey be under an obligation to insert specially by hand the new boundary so ascertained on any copy on receiving an application to that effect, the applicant paying the expense of such insertion.

The Board concur in the view expressed by the Committee, as to the inconvenience attending any attempt to insert altered boundaries on the Ordnance Survey plans until the regular revision of the district is taken up. With regard to the subsidiary recommendations of the Committee under this head, the Board will consider whether any further measures are necessary to secure the early notification of new and altered boundaries to the Director General, and they have made arrangements for the prompt delineation of such boundaries by a band of colour on sheets on the 6-inch scale, altered boundaries of counties and parishes being also shown on sheets on the 1-inch scale. Maps showing the boundaries thus delineated will be kept for inspection at the office of the Board (3, St. James's Square, S.W.) and at the Ordnance Survey Offices at Southampton, and the Board will be prepared to supply duplicates of the same to local authorities and persons desiring to receive them and willing to make a payment for the same. As the plans for each district are revised the altered boundaries will be surveyed and shown upon them in the ordinary course.

The Committee further propose that the constructors of works altering the face of the country should be required, by statute, to supply the Survey with maps showing those works, and that the surveyors in the service of various local authorities should furnish information with regard to new or altered roads or streets. The Board are not disposed to think that sufficient advantage would be gained by these arrangements to justify them in making application to Parliament for the necessary statutory powers, but, as they have stated above, they have invited the co-operation of the Board of Trade and the various sanitary authorities with a view to secure the early notification of new works and improvements for insertion on the 1-inch map. The delineation of such changes on the maps on larger scales will not be attempted until their revision is taken in hand.

III.—THIRD HEAD OF REFERENCE.

Whether the maps, as at present issued, satisfy the reasonable requirements of the public in regard to style of execution, form, information conveyed, and price; and whether any improvement can be made in the catalogue and indexes?

The Committee deal with this portion of their inquiry under the following heads:—

- (a.) General criticisms on the large-scale maps.
- (b.) General criticisms on the 1-inch map.
- (c.) General criticisms on the four-mile-to-the-inch map.

And they afterwards add—

- (d.) Observations on accuracy generally, and comparison with foreign surveys.

(a.) General Criticisms on the Large-Scale Maps.

The Committee make no recommendations under this head. They point out that the greater part of the errors to which their attention was called were due to want of revision, the remainder being chiefly matters of opinion—very few being original errors in the work.

(b.) General Criticisms on the 1-Inch Map.

The Committee consider that, as regards general design and execution, the new series 1-inch map satisfies the conditions required from a map on that scale. It is, they observe, excellent in the quality of its engraving, and its general accuracy, except from causes arising from want of revision, indisputable.

With a view to enable the hill-shaded edition to be produced in black, with hills in colour, the Committee recommend that the duplication of plates, so as to give a separate hill-plate, should be undertaken as soon as practicable.

The Board concur in the opinion thus expressed, alike on the grounds of convenience and economy, and they hope to find themselves able to make arrangements by which the work of duplication will be carried out gradually as the revision of the map progresses.

The Committee further suggest that an exhaustive inquiry, coupled with experiments, should be instituted into the practice of heliogravure, with a view to ascertain whether that process might be substituted for engraving in the preparation of hill-plates without serious deterioration of effect.

With regard to this recommendation the Director-General points out to the Board that the substitution of heliogravure for engraving would completely alter the character of the 1-inch hill map of England, would create want of uniformity between the sheets in different parts of the country, and would give England an inferior map to that of Scotland or Ireland. The Director-General further expresses his belief that the change would not give satisfaction, and that the public would eventually demand a return to engraving.

The Board attach considerable importance to the objections thus formulated, and the difference in cost between the two processes does not appear to be sufficient to outweigh them. The estimated cost of completing the engraved map from the 1st January 1893 is 80,000*l.*, and even if the proposed inquiry resulted in favour of heliogravure as against engraving, it is not probable that the economy gained by the substitution of the inferior process would exceed 20,000*l.* The gross saving would, of course, be much more than this, but it would be necessary to take into account the cost of the superannuation of the hill engravers, the re-sketching of a large district in a style suitable for re-drawing by heliogravure, the cost of training and disposing of the necessary workmen, and possibly of introducing foreign workmen.

It appears to the Board that the recommendation of the Committee is very much based upon the fact that the process of heliogravure is a more expeditious one than engraving, and that by its adoption the completion of the definitive 1-inch map with hills could be greatly expedited. In the desirability of securing this result the Board entirely concur, and after consultation with the Director-General they are of opinion that it will be possible to secure it, without unduly increasing the annual outlay on this portion of the programme of the Survey. It has hitherto been contemplated that the hill-map would be completed, partly by photo-zincography and partly by engraving, in 1900, and that the engraving would be completed in 1910. The dates which the Board now propose to keep in view, in the preparation of the annual Estimates for submission to the Treasury, are:—1898 for the combined photo-zincographed and engraved map, and 1902 for the engraved map—an acceleration which will be in entire consonance with the wishes of the Committee.

Whilst, however, the opinion of the Board is at present adverse to the substitution of heliogravure for engraving, they approve of the proposal of the Director-General that some further experiments should be made with regard to the cheaper and more rapid process, and it is possible that the results obtained may lead to the modification of the views above expressed.

(c.) *General Criticisms on the Four-Mile-to-the-Inch Map.*

The Committee refer to the circumstances under which the most recent issue of this map was made, and to the criticisms with which it was received. They recommend that its essentially temporary character should be unmistakably indicated on each sheet sold in future, and that the map should be corrected and completed with hills so soon as the 1-inch map is out of hand.

The Board agree. The words "temporary edition" are now placed at the head of each sheet, and the Board propose that the revision of the map should be taken in hand so soon as the results of the revision of the 1-inch map are available.

The Committee further suggest, for consideration, whether contours can be inserted with advantage on a map of this scale. The point is one which it is at present premature to finally settle, and the Board propose to consider the whole question as to the form or forms in which the map should be issued when the time for the publication of the revised edition more nearly approaches.

(d.) *Accuracy generally, and comparison with Foreign Surveys.*

The Committee make no recommendation under this head, but the Board note, with much satisfaction, the evidence cited by the Committee as to the general accuracy of the work of the Survey.

COMPLAINTS AND SUGGESTIONS.

The Committee proceed to consider the principal complaints and suggestions brought to their notice.

(1.) *Want of Revision.*

This subject has already been dealt with under the second head of reference.

(2.) *Want of Uniformity of Style and Paper.*

The Committee recommend that such a modification be made in the method of assessing the cost of the maps as will enable equal areas of the 6-inch map, whether engraved or photo-zincographed, to be sold to the public at least at the same price, say, the engraved sheets at 3s. each, and the quarter sheets at 9d. each, instead of 2s. 6d. and 1s. respectively, as is at present the case.

The prices at present charged for the whole and quarter sheets are, doubtless, as the Committee point out, somewhat anomalous, but, on the other hand, the change proposed is attended with some difficulty and expense. In Scotland and Ireland there are no photo-zincographed quarter sheets, and the increase of the price of the full sheets, unattended by any equivalent reduction in another direction, would not improbably give rise to complaint, and even if this objection were set aside, the expense of altering the price on all copper plates, on printed impressions, and in the catalogues and indexes, would be very considerable. In these circumstances, the balance of argument appears to be adverse to any change in the direction indicated by the Committee, especially as the Board have no reason to think that the present arrangement stands in the way, to any appreciable extent, of the sale of the maps.

The Committee further recommend that, with a view to secure uniformity of paper, arrangements should be made with particular manufacturers to supply special standard papers, suited to each scale of map, over long periods of time, and that the conditions of the paper supply for maps generally should be reconsidered, and that the Survey should be allowed to control its own supply.

The Board share the views expressed by the Committee on these points, and they are glad to learn that the Stationery Office have no objection to their being carried into effect. It will be necessary, however, that provision for the cost of the purchase of the paper should be made in the Survey Estimates, instead of those for the Stationery Office, as heretofore, and the Board will submit proposals on the subject to the Treasury for consideration in connexion with the Estimates for the year 1894-5.

(3.) *Insufficiency of Contours.*

The Committee discuss this matter in considerable detail, and inasmuch as the proposals recently made with regard to it involve the expenditure of a very considerable sum, it is desirable that the Board should state fully the conclusions at which they have arrived respecting it.

The scheme of survey at present authorised provides for the insertion on the 1-inch and 6-inch maps of instrumental contours at 50 feet, 100 feet, and at every subsequent 100 feet up to 1,000 feet. Sketched contours above 1,000 feet appear at intervals of 100 feet on the 1-inch map, but not on the 6-inch map. These arrangements are based on the recommendations of Lord Ellesmere's Committee of 1854.

The committee of officers appointed in March 1892 by the then Secretary of State for War recommended the insertion in the 1-inch maps of additional instrumental contours at 25 and 75 feet, at an estimated cost of 52,000*l.*, and at 150, 250, and 350 feet at a further estimated cost of 161,000*l.*, or, in the event of the Treasury being unwilling to entertain proposals involving so large an expenditure as 213,000*l.*, and of the maintenance of the objections of civil

engineers to the insertion in the maps of interpolated contours, the committee recommended that contours at the levels named should be interpolated in the proposed military 1-inch map, at the cost of 75,000*l*. The same committee also suggested that if the number of instrumental contours throughout the country was not increased, they should, at all events, be run in the more important parts of the country; and they also considered that contours should be interpolated at 25 feet intervals on the 6-inch maps.

The Departmental Committee, whose report is now the subject of the Board's consideration, "hesitate to recommend any very great expenditure for extending the present system of contours in the complete and thorough manner" suggested, and they "consider it very doubtful whether it is necessary to apply, at great cost, a system to the whole country which is likely to be of material benefit only to small portions." The Committee think, however, that contours at 250 feet intervals above 1,000 feet should be interpolated by water-level as early as possible, at an estimated cost of 23,500*l*. They consider that the two contours of 25 feet and 75 feet, if confined to districts where there are large areas of low-lying lands, would be very useful, and they think it eminently desirable that in lieu of any expense being incurred for sketched contours for military purposes, the work should be properly done, with accuracy sufficient for other purposes.

So far as the recommendations of the War Office Committee are concerned, the Board have already informed the War Department that it is for them to formulate their requirements for military purposes, and to submit their proposals to the Treasury for consideration from a financial point of view. If Their Lordships determine that the further expenditure which the adoption of the proposals of the War Office Committee would entail is desirable and necessary, the Board will be prepared to undertake the additional services recommended, but it would be impossible for them to do so within the limits of the present Estimates without a serious curtailment of the ordinary programme of the Survey, such as, in the opinion of the Board, could only be justified in view of the most urgent necessity.

With regard to the proposals of the Departmental Committee, it is to be observed that in any case the expenditure of a substantial sum would be requisite to give effect to them, and the Board do not consider that the case for the additional detail suggested is so strong as to justify them in submitting those proposals for the sanction of the Treasury until provision has been made for the completion of the present programme of the Survey and of the revision of the 6-inch and 25-inch maps within a comparatively short period. The limitation of the 25-foot and 75-foot contours to large areas of low-lying lands would not have the effect of greatly reducing the estimate of 52,000*l*. above referred to, and the sum required for the purpose, together with the 23,500*l*. required for the interpolation of levels above 1,000 feet, would constitute a serious additional charge upon the Exchequer, and one which the Board feel must, at any rate, be postponed until the more pressing requirements of the Survey are satisfied.

(4.) *Desirability of introducing heliogravure or some more rapid method of hill-shading for the map of England.*

This matter has already been dealt with under the heading, "General criticisms on the 1-inch map."

(5.) *Inconvenience caused by numerous meridians.*

The Committee arrive at the conclusion that no serious inconvenience is caused by the varying meridians and parallels of latitude for sheets lying approximately east and west of each other, since the method of filling up the blank portions of the sheets has been adopted. They recommend, however, that the engraved plates, not originally engraved beyond the county boundary and not yet filled in, should be dealt with at as early a date as practicable, so as to avoid the inconvenience which unfilled sheets undoubtedly cause to the users of the maps.

The Board concur with the Committee that the filling up of partially filled engraved sheets is very desirable, but the work would entail great labour and expense, and could not be carried out at once, owing to the pressure of other work in the engraving department. Moreover, in cases such as the southern and south-eastern counties, where great changes have taken place, it would be a waste of money to fill up the plates from the original survey. In these circumstances the proper principle appears to the Board to be to fill up the plates as the revision proceeds, and thus provide for the gradual supersession of the unfilled sheets. In the meantime, however, when full sheets are asked for, on the 6-inch scale, in specific cases, and the adjoining counties are engraved, such sheets will be published specially by transfer from copper to zinc, with a view to minimise any inconvenience which may attend the use of partly filled sheets.

(6.) *That the Indexes are inconvenient and difficult to understand.*

The Committee recommend, *inter alia*, (a) that the town indexes be continued as at present; (b) that the newest form of index on the scale of two or three miles to an inch, now in use for the 6-inch maps, be adopted as an index to the 25-inch scale, showing only the sheet lines of this latter scale; (c) that the same form of index on a separate map be adopted as the index for the 6-inch maps, showing only the sheet lines of the 6-inch maps; (d) that the index to the 1-inch map be continued as at present, but that more names should be given on it; (e) that the combined index, known as the "4-inch index showing civil parishes," be retained for the use of civil engineers and others versed in the use of maps; (f) that a uniform style of heading be

adopted; (g) that in the event of any partial revision being carried out on any scale, the indexes on that and all smaller scales should remain unrevised till general revision occurs; and (h) that a list of the 25-inch plans in each county should be given in the catalogue.

The Board concur with the Committee in these recommendations, and effect will be given to them as and when opportunity offers.

The Committee further recommend that the table of areas of parishes be no longer printed on the index to the 6-inch maps, but be published in pamphlet form for each county, together with general county information, sketch-indexes, and particulars as to the nature of the survey, the places where the maps may be obtained, and other information of a general character. The Committee suggest that these county pamphlets should be issued with a fancy paper cover, sold at as low a price as practicable, and placed generally in the hands of the bookselling trade and at railway bookstalls. The Committee further propose that the sketch-indexes might also be placed separately, as leaflets, in the hands of map agents for gratuitous, or nearly gratuitous, distribution, so as, in some measure, to serve as an advertisement of the Survey.

The Board gather from the observations of the Committee in regard to this recommendation that the object they have in view is the increase of the sales of the maps, and although the Board are doubtful as to whether the issue of the proposed pamphlet will produce this result to any material extent, they think that the experiment is one which may well be made, if the cost involved is not excessive. They have, therefore, given directions for the preparation of a specimen pamphlet of the description proposed, the selling price to be not more than 1s. It will then be possible to see what charge upon the Survey Vote would be involved, and whether there would be a reasonable probability of the outlay being justified by increased sales. In the meantime, it appears to the Board desirable to continue to include tables of areas on the indexes to the 6-inch maps, which have already been completed and published for the whole of Great Britain. The proposed free distribution of rough sketch-indexes will necessarily stand over for further consideration.

(7.) *Difficulty of mounting maps owing to shrinkage.*

The Committee observe that the adoption of an uniform paper for each class of map will reduce this difficulty to a minimum, but that it can never be altogether surmounted.

The Board agree, but care will continue to be taken to get the maps as accurate in this respect as possible.

(8.) *That colour-printed maps should be published, or that private firms be permitted to publish them.*

The Committee recommend that the requirements of the War Office and of the public might be met by the publication of a new 1-inch coloured map for military purposes.

This recommendation is further discussed by the Committee at a later stage of their Report, and the Board will place on record the conclusions at which they have arrived respecting it in a later portion of the present minute.

The Committee are of opinion that over and above the engraved outline 1-inch map, the 1-inch map with hills, the proposed new 1-inch coloured map for military purposes, the 4-mile map, and the 10-mile map, any further maps on the 1-inch or smaller scales required to meet special purposes should be left to private enterprise; and they recommend that reproductions of the Ordnance Survey maps, either by transfers from the plates of the 1-inch or smaller scales, or otherwise, should be permitted on certain specified conditions.

The Board see no reason to differ, in principle, from the conclusions at which the Committee thus arrive, but they would observe that publishers are permitted at the present time to utilise the Ordnance Survey maps, the only objections which have been raised being to the publication of fac-similes and to the use of the term "Ordnance." This being the case, serious objection would probably be taken by map publishers to the adoption of any other rule, especially if the utilisation of the maps were made conditional on any substantial payment being made; and with regard to the supply of transfers, it is to be presumed that publishers would only desire to adopt this course of procedure provided that the cost was such as to enable them to produce their maps more cheaply than would otherwise be the case.

Moreover, the bearing of such an arrangement upon existing contract obligations would require to be kept carefully in view.

Having regard to these considerations, the Board have not considered it desirable to formulate any general rules on the subject, but they will deal with any individual applications which they may from time to time receive, on the lines indicated by the Committee, so far as it is within the power of the Board to do so.

The Committee suggest that the proposed military 1-inch map, in colour, and the 4-mile and 10-mile maps might, if desired, be produced by contract with private firms from materials supplied by the Survey Department. The Board will keep this suggestion in view, but they apprehend that if the payments for such work have to come out of the Survey Vote, it is doubtful whether any real advantage would be secured.

(9.) *That combined sheets of country round towns should be published both on the 6-inch and 1-inch scales.*

The Committee advise the issue of combination sheets, combining all the districts round important centres on one sheet, the same to be gradually effected; those places where the demand for such maps is likely to be the largest being first selected, and care being taken that the work is done in such a manner as not to interfere with or check the current operations of the Survey.

The Board concur in the opinion expressed before the Committee as to the convenience and probable popularity of combined sheets, and something has already been done in the direction indicated. Combined sheets have been issued in the case of the Isle of Wight, the Isle of Man, and Brighton, and a combined sheet of Chatham is in hand.

A financial difficulty, however, stands in the way of the general adoption of the recommendation of the Committee in the fact that, so long as the whole proceeds of the sale of the maps are appropriated in aid of the Vote for the expenses of the Stationery Office, a very large proportion of the cost of their production is necessarily charged to the Vote for the Ordnance Survey. Even if therefore the issue of additional combined sheets commanded a large sale and proved remunerative, as would probably be the case, the result would nevertheless be to impose an additional charge upon the Survey Vote, which, in view of the demands of the existing programme, the Board are anxious to avoid. The Board are in communication with the Treasury on this matter, and they trust that in the result they may find themselves in a position to sanction the issue of further maps of the description proposed, on the lines indicated in the report of the Committee.

(10.) *That the classification of roads is bad.*

The Committee recommend that roads should be classified for the purposes of representation on the Ordnance Survey maps, as follows:—

First-class.—Roads with over 14 feet in width of good metal, fit for fast traffic at all seasons of the year.

Second-class.—Roads of similar character with less than 14 feet in width of good metal.

Third-class.—Metalled roads of an inferior character, whether maintained by a public authority or not.

Fourth-class.—Unmetalled roads, tracks, and green lanes.

The Committee further suggest that any roads in the first two classes not repaired by an authority under legal obligation to maintain them, should be distinguished from others.

With the exception of the last suggestion, there is no practical difficulty in giving effect to these proposals. The Secretary of State for War has expressed his concurrence with the recommendation that the roads should be divided into four classes, and this will be carried into effect.

(11.) *That the expense of coloured impressions is too high.*

The Committee call attention to the prices of the coloured maps on the 25-inch and 10-foot scales, and recommend that one form only should be published, with the houses cross-hatched. They refer to the fact that cross-hatching was tried some years ago and abandoned, and that they had it in evidence that the process necessarily renders the work on the map coarser, but they report that the feeling in favour of the change is so strong that they consider it should be adopted. Experiments have since been made into the various means by which buildings can be distinguished from other details, and the results obtained go to show that this object can best be accomplished by the adoption of "stippling" for town-plans, and by hatching for the 25-inch maps. These processes will, for the future, be adopted, a course which allows of the maps being placed on sale at a price which will afford no ground of complaint to those who may have occasion to purchase them.

(12.) *That hedge-row timber, single trees, as well as trees, shrubs, and paths in gardens should be omitted.*

The Committee suggest that whenever any complete revision of a town map takes place, a considerable amount of the minor and less important detail, generally of a transitory nature, should be omitted, and they recommend that when a general revision of the 25-inch map takes place, the objects enumerated for omission on the larger scales should be left out on this scale also, but that woods, forests, avenues of trees, and orchards, be shown as at present.

The Board agree with the recommendations of the Committee under this head, and detailed instructions on the subject have been issued for the guidance of the officers of the Survey.

(13.) *It has been objected that the Ordnance Survey maps do not show property boundaries.*

The Committee recognise that the boundaries of parcels of land on the Ordnance Survey maps are the existing fences, and not the legal boundary of ownership of the soil, which frequently is the edge of a ditch not shown on the plan, but the Committee point out that any other course than the one adopted by the Survey is impracticable, it being easy for anyone interested in the matter to mark on the map by conventional signs the position of the legal boundary.

The Board concur in the opinion thus expressed.

(14.) *That footpaths are shown on the Ordnance Survey plans which do not exist.*

The Committee are of opinion that it is impossible for the Ordnance Survey to discriminate between public and private footpaths, but they think that, by printed and more definite instructions to the field surveyors, it might be possible to prevent the insertion on the map of numerous temporary tracks; that nothing but a well-defined and apparently permanent track should be placed on the map, and that such a track should be shown as a footpath whether it is public or private.

The Board concur in these proposals, to which effect will be given as the revision of the published plans proceeds. At the same time difficulties may present themselves in deciding what should, and what should not, appear on the revised maps; and the Survey officers will be instructed to take every care that the public do not suffer from the omission of any temporary convenience footpaths. The original plans, upon which every footpath is shown that was a feature on the ground at the time at which the survey was made, will remain available for reference.

(15.) *It has been suggested that a key to conventional signs should be printed on the margins of the Ordnance Survey maps.*

The Committee recommend that a key to the principal conventional signs should be added on the margin of the 6-inch, 25-inch, and town-scale maps where room can be found for it.

The Board agree, and the recommendation has been carried out. Such a key now appears on the margins of plans of all scales.

(16.) *It has been suggested that reference numbers be given up, or that the numbering be by sheets instead of parishes.*

With regard to this suggestion, the Committee express the opinion that it would be well upon revision to omit the reference numbers altogether, to continue to stamp the areas in the enclosures as at present, to extend the printed areas to much smaller enclosures than at present, and to make use of the printed areas, if necessity requires it, for purposes of identification. In connexion with the last-mentioned recommendation, the Committee point out that it would be rare in any single sheet to find the numerical quantity of any area exactly repeated, and such quantities would probably be more permanent on the whole than the present numbers. The Committee further suggest that facility of identification of parcels might also be greatly aided if the sheets were rendered capable of division into squares, lettered points at the north and south and numbered points at the east and west being placed on the margin.

The evidence received by the Committee under this head was of a conflicting character, and representations have subsequently been received by the Board which have led them to the conclusion that the weight of opinion amongst those who make practical use of the maps is in favour of the retention of the present system of giving reference numbers and areas. In these circumstances, the Board propose to make no change in the direction indicated by the Committee.

The suggestion that the maps should be divided into squares with a view to facilitate the identification of parcels will be kept in view, but the Board entertain some doubt as to whether the additional labour and expense involved would be justified in practice.

(17.) *It has been suggested that all boundaries, except county boundaries, be removed from the ordinary 1-inch Map.*

The Committee recommend the omission of all boundaries other than county boundaries from the ordinary 1-inch map; and they observe that the insertion of the parish boundaries is needless, and tends to confuse the other and more important details.

The Board have been in communication with the Local Government Board on this subject, and they learn that, having regard to the purposes for which Ordnance maps are usually consulted in that Office, the Local Government Board would view, with regret, any change which would render the 1-inch Ordnance map no longer available for the definition of parish boundaries, and it is added that cases frequently occur in which it is of great advantage to have the parish boundaries of an extensive area shown in a map of a convenient size. Having regard to this expression of opinion, the Board do not feel that they could, with advantage, authorise the adoption of the change suggested by the Committee, and they propose that the boundaries delineated in the 1-inch map should continue to be given as heretofore.

(18.) *It has been suggested that Maps on certain additional scales be published.*

The Committee are unable to recommend the production of any of the additional maps suggested to them except a 2-inch scale map to the extent to which it may be required by the military authorities. They are of opinion that the present scales of the Ordnance Survey meet all the reasonable requirements of the public, and that special scales required for special purposes should be left to private enterprise.

The Board agree with these conclusions, which are in conformity with their desire to avoid any extension of the existing programme of the Survey until due provision has been made for the

completion of that programme within a reasonable period. With regard to the production of a 2-inch map for military purposes, the Board have informed the Secretary of State that special maps of small areas, for defence purposes or for manoeuvres, can be prepared on the 2-inch scale, the cost being defrayed out of the sum annually provided for Special Services for other Departments, but that it is for the War Department to obtain the authority of the Treasury for the preparation of maps of more extended areas on the scale in question.

- (19.) *It has been suggested that the depths of lakes, and some indication of the depth of water round the coast, should be shown on the Ordnance Survey maps.*

The Committee approve of the arrangements made by which contour lines have been shown, on recent sheets, round the coast at depths of 25, 50, 75, 100, 150, and 250 feet, and they recommend that the depths be added to important inland waters.

The suggestion made by the Committee will be kept in view for consideration when the Estimates for 1894-5 are in course of preparation, but in the meantime the Director-General has been in communication with Dr. H. R. Mill, who, with the aid of the Royal Geographical Society, has recently been engaged in making a systematic bathymetrical survey of the larger lakes of Cumberland and Lancashire, with a view to the utilisation of the work of that gentleman for Ordnance Survey purposes.

- (20.) *An edition of the 1-inch map and of maps on a larger scale on thin tough paper has been suggested.*

The Board consider this subject, so far as the 1-inch map is concerned, under the head which next follows. The Committee are unable to recommend the preparation of a thin paper edition of the larger scales, and they point out that on demand, a thin paper edition of any 6-inch map, or of those on smaller scales can be had at slightly increased charges.

- (21.) *A cheap edition of the 1-inch map has been suggested.*

The Committee recommend that this proposal be carried out by transfer to zinc or stone, and they suggest, for consideration, whether a portion of the edition should not be sold folded ready for use.

The Board agree that the issue of the proposed thin paper edition of the 1-inch map would meet a legitimate public demand and command a ready sale. The result of the inquiries and experiments which have been instituted goes to show that there is no practical difficulty in the way of the new departure proposed, and that the expenditure requisite for the experimental issue of certain sheets would not be large. The Board propose to present the subject for the consideration of the Treasury when the Estimates for 1894-5 are in course of settlement, and the Board trust that before long they may be in a position to give practical effect to the recommendations of the Committee.

- (22.) *It has been stated that the Ordnance Survey maps are too expensive.*

The Committee state that having considered the whole subject carefully, they are unable to recommend any reduction in the price of the large-scale maps, which they cannot consider excessive when regard is had to the amount of information conveyed, or the care and labour entailed in production. The Committee arrive at a similar conclusion with respect to the 6-inch and 1-inch maps, although for a special reason they recommend a reduction in the price of the 6-inch photozincographed maps. This recommendation the Board have already considered in detail (page 8), and it only remains for them to express their general concurrence with the views expressed by the Committee.

- (23.) *The question has been raised whether boundaries should be revised on the Ordnance Survey maps as soon as altered, or whether they should wait for general revision.*

This question has already been considered by the Board under the head "General Remarks on Revision."

- (24.) *Stress has been laid on the inaccuracy and insufficiency of names.*

The Committee believe that, so far as the English names on the map are concerned, the errors are no more than are inseparable from every cartographical undertaking such as the Ordnance Survey; and with regard to the Welsh names, to which subject special attention was given by the Committee in accordance with an undertaking given by the President of the Board to Mr. Thomas Ellis, M.P., the Committee report that although the rules prescribed for the determination and spelling of those names are based on sound principles, special arrangements should be made to secure revision and correction in such cases.

The Board concur in the recommendations made by the Committee under this head, and when the revision of the larger scale maps takes place they will endeavour to give practical effect thereto. With regard to the 1-inch map now in course of publication, the Committee come to the

conclusion that there is no sufficient amount of error to justify the suspension of the publication of the 1-inch maps of the Welsh counties, which is now on the point of taking place; but in view of the criticisms which have been made, the Board have made arrangements whereby proofs of the sheets not yet published are to be submitted to competent Welsh scholars for examination prior to issue.

(25.) *The want of any knowledge throughout the country of the operations of the Ordnance Survey.*

The Committee make no separate recommendations under this head.

(26.) *Minor suggestions.*

(a.) *That town indexes be published without sheet lines as an advance edition of the 6-inch map.*
The Committee are unable to recommend this plan for adoption.

(b.) *That the agents' names and addresses be printed on all Ordnance Survey maps.*

The Committee cannot recommend this proposal on account of the cost which would be entailed if the agents were changed.

(c.) *That printed notices of publication be sent to certain firms of map agents.*

The Committee are of opinion that the weekly notices of publication now furnished only to Messrs. Stanford should be sent to the leading firms of map sellers throughout the three kingdoms.

The Board concur, and in consultation with the Stationery Office they have made arrangements for the purpose.

(d.) *In the elimination of detail from the 25-inch map before reduction to the 6-inch scale it has been suggested by the Director-General that the boundary descriptions (4 ft. R.H., &c.) be omitted.*

The Committee approve of the suggestion, and the Board concur. It is being carried into effect in the revised 6-inch maps of Lancashire.

(27.) *Various suggestions have been made by the War Office Committee (1891) on a Military Map of the United Kingdom which affect the General Map of the United Kingdom.*

Except in a few minor points the Committee concur in the recommendations of the military committee, as far as they affect the general maps of the Ordnance Survey, and they also concur generally in their opinions as to the 1-inch map in outline. The Committee suggest, however, that in the proposed coloured edition of the 1-inch map, the railways should be shown in black instead of red, as recommended by the military committee, and the Board learn on communication with the War Office, that that Department is prepared to accept this recommendation.

The Committee further recommend that the state of the revision of the Cadastral Survey, and that of the 1-inch map, should be entered in the Annual Report and estimates of the Director-General, under separate headings, that this officer should distinctly state whether he finds that the sums provided are what are necessary for keeping up the revision of the cadastral and 1-inch surveys at the intervals for which they are arranged, and that he should record in his Annual Report all suggestions made by him to the Minister under whom he is placed which he considers essential for the conduct of the survey. The Board concur with the Committee that publicity should periodically be given to the position of the Survey in regard to revision, and they propose that full information under this head should be supplied in the Annual Report of the progress of the Survey, and further that additional particulars with respect to the engagements of the Survey should, with the concurrence of the Treasury, be set out in the annual Estimates for the Survey. In view, however, of the considerations set out in an earlier portion of this Minute, with regard to the intervals for which revision is to be arranged, it would not be practicable for the Board to give effect to the second of the suggestions above referred to, and the concluding suggestion appears to the Board to be based upon an erroneous view of the respective responsibilities of themselves and the Director-General. It would, in the opinion of the Board, be contrary to usage and sound principle that questions upon which they do not find themselves in agreement with an officer acting under their control should necessarily be made public, and the Board are glad to know that the Director-General concurs with them in the opinion that the adoption of the course suggested by the Committee would not further the interests of the Survey.

The Committee conclude their Report by expressing their opinion that, after a full investigation of the subjects submitted to them, they are convinced that the basis of the Ordnance Survey is perfectly accurate and satisfactory. They observe that the great necessities of the Survey are obviously completion and early revision, and that with these necessities not even any suggested improvements should be allowed to interfere. But should the sums which they have proposed for the purpose of revision be granted, and should the various recommendations which they have suggested be carried out, the Committee confidently anticipate that the public will have no reasonable grounds for complaint as regards this great national work.

The Board read these observations with much satisfaction, and they express their full concurrence therewith. So far as the recommendations of the Committee relate to matters within the exclusive control of the Board, they have been glad to give the fullest consideration to the proposals of the Committee, and they have thought it desirable to set out their conclusions

in this Minute. The matters involving financial issues must necessarily be determined by the Lords Commissioners of Her Majesty's Treasury in consultation with the Board, and as to these matters it is only necessary for the Board to express the hope that financial exigencies will permit of full provision being made for meeting the existing requirements of the Survey within a reasonable period.

The Board note with pleasure the testimony borne by the Committee to the service rendered by Major Johnston, R.E., as their Secretary, and they cannot conclude this Minute without again expressing their obligation to the Committee for the great care and attention which its members have been so good as to devote to the investigation of the subject referred to them. The Report of the Committee is in itself conclusive evidence of the thoroughness and searching character of that investigation, and the Board have no doubt that the labours of the Committee will prove of considerable public advantage, and that they will be for the permanent benefit of the Survey.

By order of the Board,

(Signed) T. H. ELLIOTT,
Secretary.

22nd December 1893.

REPORT OF THE PROGRESS
OF THE
ORDNANCE SURVEY,

To the 31st December 1892.

Presented to both Houses of Parliament by Command of Her Majesty.



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1893.

CONTENTS.

Section	Page.
I.—General Account of the Survey	3
(a.) Town Surveys	3
(b.) Cadastral Survey	5
(c.) The 6-inch Map	7
(d.) The 1-inch Map	7
(e.) The 4-mile Map	9
(f.) The 10-mile Map	9
II.—State of the Survey and Publication of Maps :	
1. England and Wales	10
2. Scotland	11
3. Ireland	12
4. Isle of Man	13
Tabular Statement of Progress	13
III.—Personnel	14
IV.—Methods of Production	14
V.—Work for other Government Departments	16
VI.—Photozincography of Ancient MSS.	17
VII.—Sale of Maps	17
VIII.—Utilisation of the Ordnance Survey Maps	19
IX.—Return of Sums expended for and received from the Land Judges Court in Ireland in the year 1892	20
X.—Distribution of the Officers and Divisions	20
XI.—Statement of the Force employed	21
XII.—Statement showing the sums provided in the estimates and expended during the 10 years ending 31st March 1892	22

INDEX—DIAGRAMS.

No. 1.—	Survey of England and Wales,	on scales of 25 and 6 inches to a mile.
" 2	Do.	re-survey do. do.
" 3	Do.	on scale of 1 inch to a mile.
" 3A	Do.	forecast of publication of 1 inch scale map.
" 4.—	Survey of Scotland,	on scales of 25 and 6 inches to a mile.
" 4A	Do.	re-survey do. do.
" 5	Do.	on scale of 1 inch to a mile.
" 6.—	Survey of Ireland, revision of,	on scale of 6 inches to a mile.
" 6A	Do.	do. 25 do.
" 7	Do.	on scale of 1 inch to a mile.

Section I.

General Account of the Survey.

Under existing instructions the under-mentioned plans have been or are being published :—

1. Plans on a scale of 126·72 inches to a mile, $\frac{1}{500}$, of all towns with more than 4,000 inhabitants, generally known as *Town Surveys*.
2. Parish plans on a scale of 25·344 inches to a mile, $\frac{1}{2500}$, of the cultivated districts in all counties, commonly known as the *Cadastral Survey*.
3. County maps on a scale of six inches to a mile, $\frac{1}{10360}$, forming together the 6-inch map.
4. A topographical map on a scale of one inch to a mile, $\frac{1}{63360}$, in two forms, one in outline with contours, the other with hill features.
4. (a.) A temporary advance edition, published by photozincography, of the unengraved portion of the 1-inch map.
5. A map on the scale of four miles to an inch.
6. A map on the scale of 10 miles to an inch.

On the 22nd December 1886 the Treasury authorised a revision of the survey of *Great Britain* and under this authority the cultivated districts in Lancashire, Yorkshire, Wigtownshire, Kirkcudbrightshire, Edinburghshire, Haddingtonshire, Fifeshire, Kinrossshire, and the Isle of Lewis, which were originally surveyed on the 6-inch scale only, are being re-surveyed on the $\frac{1}{2500}$ scale, and the towns are being published on the $\frac{1}{500}$ scale.

On the 28th October 1887 the Treasury directed the revision of the survey of *Ireland*, which was in progress on the 6-inch scale, to be carried out on the $\frac{1}{2500}$ scale.

For details of the progress of the survey and publication of the maps on the several scales, see Section II.

The Departmental Committee appointed by the Board of Agriculture in April 1892 to inquire into and report upon the Ordnance Survey, have, in their Report dated 31st December 1892, made several important recommendations with regard to the Survey, which are now under the consideration of the Government.

The following sketch of the origin of the scales in use and the action taken from time to time in regard to them may serve to explain the present condition of the various maps.

(a.) *Town Surveys.*

Town surveys on a large scale originated in the requirements of the Valuation Department in Ireland. The valuers required a minute survey of all the principal towns on a scale of five feet to a mile for their valuation of buildings. The towns in Ireland were consequently surveyed and drawn on the 5-feet scale, whilst the survey of Ireland on a scale of six inches to a mile was in progress, 1825–40.

The town plans in Ireland were engraved on copper for the following reasons : (1) the difficulty and cost of making the number of fac-simile MS. copies of the plans required for legal uses were estimated not to be less than the cost of engraving ; and (2) the certainty of uniformity, the increased perfection of the plans on copper, the facility for future corrections and additions, and the general public utility arising from the easy distribution of copies.

In 1840 when Scotland and the six northern counties of England were ordered to be surveyed on the 6-inch scale, the towns were surveyed and drawn on the 5-feet scale ; and the plans were engraved on copper, apparently for the same reasons as those which led to the adoption of engraving in Ireland.

In 1853–54 the question of the scales upon which the Ordnance Survey maps should be drawn for permanent record was considered by the Government. A circular was issued by the Treasury on the 16th April 1853, and a large majority of the replies were in favour of a scale of 10 feet to a mile for towns. It is also stated in Treasury Minutes of the 27th December 1853, and 7th February 1854, that it had been proved to the

satisfaction of Her Majesty's Government by the experience of about 30 towns surveyed for the Board of Health, that the scale of five feet to a mile was not sufficient, and that densely populated town districts could not be delineated with sufficient distinctness for sanitary purposes on a smaller scale than 10 feet to a mile. The replies to a second circular issued by the Treasury on the 16th January 1854 were decidedly in favour of a scale of $\frac{1}{500}$, or 126·72 inches to a mile, which had been recommended for towns by the Statistical Society of London and the Statistical Conference of 1853 at Brussels.

In accordance with these opinions the Treasury issued a Minute, dated 18th May 1855, directing—

“5. That the plans of towns containing more than 4,000 inhabitants, which have hitherto been drawn on the scale of five feet to a mile, should be drawn on the scale of $\frac{1}{500}$ of the linear measurement, which is equivalent to 126·72 inches to a mile.”

This Minute, confirmed by others of later date, is still in force.

Since 1855 increase of population and other causes have led to the rise of new towns, to a large extension of most of the old towns, and to a change in the character of many of them. Between 1855 and 1891 there was an increase of 2,200,000 in the number of houses in England and Wales, and most of this increase may be classed as “Town.” When the Minute was issued a town had, as a rule, well defined limits within which there was a thickly populated area, whereas the more important towns are now surrounded by broad belts of villa residences, which are troublesome and costly to survey, and they frequently have long continuous rows of houses running out along main roads or lines of tramway.

The town areas in Great Britain which have either been surveyed or taken up for survey amount to 568,858 acres, and it is estimated that 63,648 acres have still to be surveyed, either in the form of town extensions, or of new towns that have come within the terms of the Minute since the original survey was made.

The accurate survey of these extensive areas, on a scale sufficiently large to show detail down to the size of a doorstep or an area-grating, has not only greatly increased the cost of the survey of the Kingdom but has seriously interfered with the progress of the more generally useful survey on the $\frac{1}{2500}$ scale, and the production of the maps on smaller scales. The rapid growth of the towns, and the formidable dimensions that the town surveys have assumed could scarcely have been foreseen in 1855; and it is a question whether the time has not arrived for a reconsideration of the terms of the Minute of the 18th May of that year.

When the scale of the town surveys was altered from five feet to a mile to $\frac{1}{500}$ no instructions were given in regard to publication. The engraving of the plans was at first continued, and impressions printed when required; but the introduction of the cheaper process of zincography led to a system of printing an edition of each plan, which, if sold out, would cover the cost of publication. The view taken appears to have been that the plans would be used officially, as they were in Ireland, for valuation and other purposes; and that, as the cost of making two MS. fac-simile copies of the original plan was much greater than that of publishing an edition by zincography, it was desirable to publish. The expectation that the plans would be largely used has not been fulfilled. Consequently the cost of publication has not been repaid, and a large stock of town plans has accumulated. The system, now in force, of reproducing town plans by photo-zincography has further reduced the cost of publication, but this does not affect the general question. It seems deserving of serious consideration whether the publication of town plans at the cost of the State should not cease; and whether those towns that desire the publication of their plans should not pay the entire cost. The publication of a detailed survey on such a large scale appears to be one of those cases in which local contributions may properly be required.

Survey of London on the 5-foot scale.—In 1842 the Government expressed a desire to have a survey of London made as soon as possible, showing the same detail as the Ordnance Survey of Dublin, which had been made on the 5-foot scale. Estimates were prepared and correspondence ensued, but in August 1844 the Treasury notified that they did not consider it advisable that the proposed survey of London should take place. In 1847 the Metropolitan Sanitary Commissioners made inquiries relative to the preparation of a block (skeleton) plan of the metropolis, and estimates were prepared. The Chief Commissioner of Woods and Forests then pressed that the block plan of London should be made without delay, and the Treasury authorised an expenditure not exceeding 1,000*l.* to be incurred in the necessary triangulation. Subsequently the Treasury directed that no expense was to be incurred on the work after 31st March 1848.

In consequence of this decision resolutions were passed by the Metropolitan Commissioners of Sewers, on the 1st April 1848, requesting the Board of Ordnance to continue the triangulation, and undertaking to repay the cost if necessary, and on the 30th May 1848 the Commissioners further resolved that the Board of Ordnance be requested to proceed with the block plan of the Metropolis, so far as may be necessary for the purposes of the Commissioners, with all practicable speed, and that such payments on account as may be requisite for proceeding with the survey be made from time to time out of the Sewers rates.

The Commissioners having thus undertaken to defray the expense, the survey was proceeded with, and its completion was reported by the director of the survey on the 10th February 1852.

The work executed consisted of—

A manuscript skeleton, or block plan, on the scale of 5 feet to a mile ;

Engraving 400 of the double elephant size sheets of the 5-feet block plan (including the densest parts of the Metropolis) on copper plates ;

Reducing the whole of the work surveyed to the scale of 1 foot to a mile, and engraving it on 44 double-elephant size copper plates.

The total cost of this work including the regimental pay of the Royal Sappers and Miners employed thereon, was 24,212*l*.

Repeated applications were made to the Commissioners for payment of this amount without success, the Commissioners stating that they were unable to discharge the amount out of the rates at their disposal. But in 1860 the Treasury, in order to effect a settlement, agreed to the following compromise, 10,000*l*. to be paid by the Metropolitan Board of Works out of the main drainage rates, the plates and copyright to be retained by the Ordnance Survey Department, as many copies of the plans as may be needed for practical purposes to be supplied to the Metropolitan Board, the Commissioners of Sewers of the City of London, and the several Vestries and District Boards of the Metropolis, at the rate of one shilling per sheet.

In 1863, when the Treasury authorised the extension of the Cadastral Survey to those parts of the Kingdom which had been surveyed on a scale of 1 inch to a mile only, it was decided to proceed at once in the County of Middlesex, and with the "filling in" of the skeleton plan of London. The publication of this work was completed in 1876.

The extension of the 5-foot survey of London and the revision of the published plans is now in progress. The original survey of London was published in 326 plans, the present survey will be published in 752 plans of the same size and on the same scale. As the engraving of these plans would employ 33 engravers for five years and cost nearly 20,000*l*., it has been decided to abandon the engraved plates and publish the new plans by photozincography at a cost of about 1,200*l*.

The Local Board of Hornsey have requested that the survey of their district may be made on the $\frac{1}{2500}$ scale, and this is being done on repayment of the cost.

(b.) *Cadastral Survey.*

During 1852 the desirability of adopting a larger scale than that of six inches to a mile for the national survey was much discussed by professional persons ; and by a Treasury Minute, dated the 15th April 1853, Ayrshire and Dumfriesshire were directed to be surveyed "with that degree of accuracy which would admit of the plans of the cultivated districts being hereafter drawn on the scale of 24 inches to a mile if desired."

On the 16th April 1853 the Treasury issued a circular letter "to a large number of the most experienced and scientific societies and persons in the Kingdom, requesting them to state their opinion on the comparative merits of a 6-inch, as contrasted against any larger scale, for the purposes of a national survey." The weight of authority being decidedly in favour of a larger scale, a second circular (16th January 1854), was issued to the same parties requesting them to state what scale they would recommend. The replies were referred by Treasury Minute (13th June 1854), to a committee consisting of Sir John Burgoyne, Mr. Rendel, and Mr. Blamire, who reported unanimously that the weight of evidence was in favour of a scale of $\frac{1}{2500}$, popularly known as the 25-inch scale. This scale had also been unanimously recommended for a Cadastral plan, "*plan parcellaire*" by the delegates to the International Statistical Conference, held at Brussels in 1853.

On the 14th July 1854 the Treasury directed the surveys of Ayrshire and Dumfriesshire to be drawn on the $\frac{1}{2500}$ scale, and that the course authorised in reference to those two

counties should be applied to the survey of other districts. But by the Treasury Minute of the 18th May 1855 the $\frac{1}{2500}$ scale was confined to cultivated districts.

The introduction of the $\frac{1}{2500}$ scale being strongly opposed in Parliament, a Select Committee was appointed to consider the subject. The Committee reported (Report 6th May 1856, No. 198) in favour of the $\frac{1}{2500}$ scale for cultivated districts, and, after a debate and division in the House of Commons, their report was adopted. On the 18th June 1857, however, a motion in the House of Commons to discontinue the $\frac{1}{2500}$ survey was carried by a majority of 10; and orders were issued to adopt the 6-inch scale for all new work. A Royal Commission, appointed in consequence of this decision, reported (20th May 1858) that the survey of the cultivated districts in the northern counties of England, and of the counties of Scotland, should be completed and published on the $\frac{1}{2500}$ scale; and that the question of extending the survey on the $\frac{1}{2500}$ scale to the whole of the United Kingdom, or to the whole of the United Kingdom except Ireland, should be left to the decision of the Legislature. These recommendations were followed by the issue of a Treasury Minute, directing the survey to be carried out in accordance with the Minutes of the 18th May 1855 and 25th November 1856.

In 1862 a Select Committee, appointed in 1861, recommended that the Cadastral survey on the scales directed by the Treasury Minute of the 18th May 1855, and recommended by the Royal Commission of 1858, and again directed by the Treasury Minute of the 11th September 1858, be extended to those portions of the United Kingdom which had been surveyed on the scale of one inch to a mile only. This recommendation, to which effect was given by Treasury letter of the 18th March 1863, did not apply to Ireland, Lancashire, Yorkshire, and the six Scotch counties that had been surveyed and published on the 6-inch scale.

On the 29th July 1880, the Treasury directed the progress of the Cadastral survey, as then ordered, to be accelerated, and arrangements were made to complete it by the 31st March 1890. These arrangements were carried out in the time and for the amount estimated. By the 31st March 1890 all the cultivated districts in Great Britain, excepting those in Lancashire, Yorkshire, and the six Scotch counties, had been surveyed and published on the $\frac{1}{2500}$ scale, in accordance with the recommendation of the Select Committee of 1861-62.

On the 22nd December 1886 the Treasury authorised the commencement of a revision of the plans, and it was decided that, before revising the published $\frac{1}{2500}$ plans, the cultivated districts of Lancashire, Yorkshire, and the six Scotch Counties, which had been surveyed originally on a scale of six inches to a mile only, should be placed on the $\frac{1}{2500}$ scale, the towns being published on the $\frac{1}{500}$ scale. This work is now in progress (*see* Section II.).

On the 28th October 1887 the Treasury authorised the $\frac{1}{2500}$ scale for the whole of Ireland.

It was originally intended that the plans on the $\frac{1}{2500}$ scale should be kept in manuscript and not published. Sir C. Trevelyan, in his memorandum of the 19th October 1854, remarks that "the scale of $\frac{1}{2500}$, although likely to be of great value as a central record from which copies of any portion of it on various scales may be made, could not be engraved as a whole except at an expense which would be totally disproportioned to the demand for the engraved sheets." He considered, however, that "if an engraving of the large standard map of any locality were desired, it might be executed, upon an undertaking being given to pay a certain sum or to take a certain number of copies at a certain price."

Soon afterwards Sir H. James, then Director of the Survey, recommended that copies of the plans should be made and sold to the public at a cost which should cover the entire cost of making them. The view was that by this arrangement the full advantage of the large scale map would be placed at the disposal of the public, and that the plans being used locally for a variety of purposes, there would be a considerable sale. The proposal that the $\frac{1}{2500}$ plans should be published was approved by the Select Committee of 1856, and their publication was also recommended by the Royal Commission of 1857-58.

The expectation that the $\frac{1}{2500}$ plans would be generally and largely used for the purposes for which they were made has not been entirely fulfilled. In many instances three and four editions of a plan have been printed and sold, but in most cases the original edition has never been sold out. This is partly due to ignorance of the existence of the plans in the remoter rural districts, and partly to the small use made of them for local valuation and assessment, and other purposes. The advantages derived by the public from the sale of copies of the $\frac{1}{2500}$ plans are, however, so great that it is desirable that the revised series of plans should be published at the cost of the State.

The $\frac{1}{2500}$ plans were at first published by parishes, no detail being shown on any plan beyond the parish boundary, and an area book, giving the area of every inclosure in the parish, was published at the same time. As the plans came into more general use the inconvenience arising from this mode of publication was much felt, and in 1873 the system of publishing "full sheets," that is, plans in which the detail is shown up to the margins without regard to the parish boundaries, was adopted. In 1884 the present practice of stamping the areas of the inclosures on the plans was introduced, and the plans published since that date have no area books.

(c.) *The 6-inch Map.*

In 1824, a Select Committee of the House of Commons on the Survey and Valuation of Ireland recommended that that country should be surveyed on a scale of six inches to a mile (Report, No. 445, 1824). This survey was carried out, and the great practical value of the plans resulting from it led the Government to order the six northern counties of England and the whole of Scotland to be surveyed on the 6-inch scale (Treasury Minute, 1st October 1840). In 1851, the 6-inch survey of Great Britain was discontinued on the recommendation of a Select Committee (Report, No. 519, 1851); but in 1852 it was resumed (Treasury Letter, 28th August 1852). In 1854 it was again abandoned in favour of the $\frac{1}{2500}$ scale (Treasury Minute, 14th July 1854); but in 1855 it was resumed for "the Highland and other partially cultivated and thinly peopled districts" (Treasury Minute, 18th May). Under the above orders, Lancashire, Yorkshire, Edinburghshire, Haddingtonshire, Fifeshire, Kinross-shire, Wigtownshire, Kirkcudbrightshire, and the Island of Lewis were surveyed and published on the 6-inch scale.

In 1856, on the recommendation of a Select Committee (Report, 6th May 1856, No. 198), the Treasury (Minute of 25th November 1856) authorised the reduction of the plans on the $\frac{1}{2500}$ scale to the 6-inch scale, and their separate publication on that scale. The effect of this Minute, confirmed by the Minute of the 11th September 1858 was to authorise the publication of a complete map of Great Britain on the 6-inch scale ($\frac{1}{10560}$); that is, nearly the scale ($\frac{1}{10000}$) proposed by the Brussels Conference for the general map "*tableau d'assemblage*." Under these instructions the whole Kingdom has been published on the 6-inch scale.

In Ireland the 6-inch survey was published by counties for convenience of valuation, and each county was drawn on its own meridian.

This mode of publication was also adopted for Great Britain; but, as the plans came into more general use, its inconvenience became apparent. The system of drawing as many counties as possible on the same meridian was then adopted, and, at a later period, it was decided to publish full sheets, showing the ground up to the margins of the plans without reference to the county boundaries.

The Irish plans were engraved on copper, because the cost of preparing the number of manuscript copies required by the valuation department was estimated not to be less than that of engraving them. When the 6-inch scale was adopted for Great Britain, it was decided to engrave the map, and the plans of Scotland and of 22 counties in England and Wales were engraved. In 1880, when the Survey Vote was increased for the purpose of expediting the completion of the survey, it was found to be impossible to engrave the 6-inch map in a reasonable time. The photozincographic process was consequently adopted, in 1881, to bring the map out more rapidly. The plans of 30 counties in England and Wales have been published by this process, each plan, called a quarter sheet, being one-quarter the size of an engraved plan.

(d.) *The 1-inch Map.*

The principal triangulation, commenced in 1784 by Major-General Roy, was "partly designed for astronomical purposes and partly for a map on a small scale." The map, on a scale of one inch to a mile, was considered solely as a military map, and the detail plans were commenced by officers of Royal Engineers. When, owing to the exigencies of the war, these officers could no longer be employed, the work was carried on, principally for purposes of instruction, by the Corps of Royal Military Surveyors and Draughtsmen.

The publication of some parts of this military map having created a desire on the part of the public to possess better maps than had previously existed, steps were taken to expedite its progress by engaging additional surveyors, and by giving out certain districts

to be surveyed and drawn by contract. After the conclusion of peace in 1815, the desire for a military map ceased, and its progress, from motives of public economy, became exceedingly slow. At this juncture, the gentlemen of Lincolnshire and Rutlandshire offered to take a certain number of copies of the map if Government would proceed with it in those counties. This offer was accepted, and, the staff of the survey being increased, an examination was made of the plans made by contract. These plans were found to be wanting in the necessary accuracy, and attempts were made to revise and correct them. It was, however, found after a great expenditure of labour that the map produced was not satisfactory.

In 1825, the 1-inch map of Great Britain, which had made considerable progress, was almost entirely suspended, in order that Ireland might be surveyed on the 6-inch scale. On the 1st October 1840, when, Ireland being nearly completed, the six northern counties of England and all Scotland were ordered to be surveyed on the 6-inch scale, the Treasury directed the plans to be reduced to the 1-inch scale for the completion of the general map of the Kingdom.

In 1846 Col. Colby first, and afterwards a Select Committee of the House of Commons, recommended that a 1-inch map of Ireland, similar to that of Great Britain, should be produced. The Government, however, decided that the 6-inch map was sufficient, and that the preparation of a map on any smaller scale should be left to private enterprise.

In 1850 Sir H. de la Beche pointed out the importance of a map of Ireland on the 1-inch scale for geological purposes, and suggested, with a view of diminishing the cost of engraving, that it should be engraved in outline only. The Director of the Survey was instructed, on the 28th January 1852, to commence this map, and to expedite its production, it was published in "quarter" sheets. On the 18th August 1855, the commencement of a perfect map of Ireland with the hill features was ordered. The outline sheets having proved to be of great value for geological and other purposes, it was decided to continue their publication and to produce a distinct map with the hill features. Thus, two separate 1-inch maps of Ireland were authorised, one in outline only, the other with the hill features.

About the same time this mode of publication was adopted for the 1-inch map of Great Britain which had previously been published in one form only. When the change was made the map had reached a line running east and west a little north of Hull and Preston. South of this line the 1-inch map had been based on a 1-inch and 2-inch survey, constructed on six different meridians, and published in "whole" sheets, 36-inch by 24-inch, or, in some cases, in "quarter" sheets, 18-inch by 12-inch. North of the line the map of England was based on 6-inch, and $\frac{1}{2500}$ surveys, and was constructed on one meridian; it was also published entirely in "quarter" sheets, and excepting four sheets, in two forms, outline and with hill features. The sheets on this new system were numbered as a continuation of those south of the Hull-Preston line, that is, of those forming what is known as the *old* 1-inch map, and they were considered as the completion of the military map of England and Wales. The last sheet was published before the end of 1869.

The 1-inch map of Scotland, based on 6-inch and $\frac{1}{2500}$ surveys, was constructed on its own meridian, and published in outline and with hills. The outline map is finished, and the hill map will be completed in 1893.

In May 1871 the War Department, finding that the old 1-inch map of the south of England, was not sufficiently accurate for military purposes, requested that a new 1-inch map of that portion of the Kingdom might be published, with hill features, as the Cadastral survey progressed. This map was authorised in July 1872, and it was decided to publish it on the same projection, and in the same form as the sheets north of the Hull-Preston line, so that eventually there might be a uniform map of England and Wales on the 1-inch scale similar to those of Scotland and Ireland.

To carry out the scheme of a uniform map Sir Henry James, then Director-General of the Survey, re-numbered the sheets north of the Hull-Preston line, commencing with No. 1, Berwick-on-Tweed, and extended the series southwards so as to include the whole of England and Wales. This map, of which all the sheets are identical in size and construction, is called the "new series" 1-inch map, though the northern sheets were originally published in completion of the old 1-inch map.

The slow progress of the Cadastral survey and the employment of the engravers on the map of Scotland delayed the production of the *outline* edition of the new map, and it was not until 1887 that steps could be taken to expedite its publication. Under existing arrangements it will be completed by the end of 1896.

On the 8th August 1891 the Treasury authorised the publication of an advance edition of the 1-inch map by photozincography so as to enable the whole of England and Wales to be published in this form, or by engraving, by the end of 1892.

This has been carried out with the exception of three sheets which have been kept back for the insertion of new detail, and will be published this year.

When the new series map, *with hill features*, was commenced it was found that the hill features, taken from the old field sketches were not sufficiently accurate, and it became necessary to re-sketch them on the ground. These sketches could not be made until the Cadastral plans had been reduced, and the ground had been contoured; the progress for many years was consequently slow, and the field work will not be completed until 1898. In 1872, and again in 1887, the question of completing the publication of the new 1-inch hill map by a rapid reproductive process was carefully considered. The conclusion arrived at was that the standard map of England and Wales ought not to be inferior to the maps of Scotland and Ireland, and that, like them, it should be completed by engraving. Under existing arrangements the whole of this map will be engraved before the end of 1910, and it is probable that this date will be anticipated.

In 1872 the Treasury laid down that the outline sheets might at any time, if it were thought advisable, be completed by printing on them hill features by a cheaper process than that of engraving. As there was no public demand for the early completion of the new series map with hill features, and the evidence afforded by the sales in Scotland and the north of England tended to show that the outline edition was most generally used, no steps were taken to expedite the publication of the hill map. In 1891, however, a general wish having been expressed that more rapid progress should be made, the Treasury authorised the completion of the hill map partly by engraving and partly by photozincography by the end of 1900. Arrangements have been made for carrying out this work.

In conformity with a recommendation made by the Departmental Committee appointed in April 1892 to enquire into and report upon the Ordnance Survey, the *revision* of the 1-inch map will in future be carried out independently of that of the larger scale maps, and the Treasury have approved of an addition to the Survey Estimates for this purpose. The revision will be commenced at once, and will, it is expected, be completed in four years' time from the 1st April next. After that time no portion of the map will represent a survey or revision more than 15 years' old, and all the sheets will be completed as regards railways, canals, &c.

(e.) *The 4-Mile Map.*

The map on a scale of four miles to an inch was commenced in 1859 as a general map of the Kingdom on that scale. In 1872, when the new 1-inch map was authorised, the engraving of the 4-mile map, then well advanced, was discontinued; the intention being to delay the publication of the map until it could be revised from the new survey.

In 1884, however, the Director-General of the Geological Survey requested that it might be completed, as even in its state at that time it was considered to be sufficiently accurate for geological purposes. The map was consequently completed without any revision excepting the insertion of new railways. Subsequently a demand for transfers from the plates and other circumstances having indicated that its issue would meet a public want, it was published with its known imperfections. To guard against any possible misconception a note was added to each sheet to the effect that it was reduced from the old 1-inch map.

The revision of this map will immediately follow that of the 1-inch map, and will be commenced this year. When the outline has been revised the map will be completed with the hill features.

(f.) *The 10-Mile Map.*

The map on a scale of 10 miles to an inch has been engraved as an index to the 1-inch map. It will eventually be revised and published as a general map of the Kingdom.

Section II.

State of the Survey and Publication of Maps.

1. England and Wales.

Area, 59,651 square miles.*

TOWN SURVEYS.

The plans of all towns entitled to a large scale survey, at the date of the survey of the district in which they are situated, have been published.

For the state of the *re-survey* of towns in Lancashire and Yorkshire, and the *revision* of published town plans, see p. 11.

THE CADASTRAL SURVEY ON THE $\frac{1}{2500}$ SCALE.

(Vide Map, No. 1.)

All cultivated districts in England and Wales, with the exception of Lancashire and Yorkshire, have been surveyed and published on the $\frac{1}{2500}$ scale, in accordance with the recommendations of the Select Committee of 1862. The *re-survey* of the cultivated districts in Lancashire and Yorkshire on the $\frac{1}{2500}$ scale, and the *revision* of the uncultivated districts on the 6-inch scale are now in progress, see p. 11.

PUBLICATION OF THE MAPS ON A SCALE OF SIX INCHES TO A MILE.

(Vide Map, No. 1.)

All England and Wales has been published on the 6-inch scale.

PUBLICATION OF THE MAP ON A SCALE OF ONE INCH TO A MILE. (New Series.)

(Vide Map, No. 3.)

The *new series* 1-inch map, based upon the $\frac{1}{2500}$ and 6-inch surveys, is published in two forms:—

1. Outline and Contours. The area published is 45,365 square miles, of which 4,708 square miles were published during the year.

The publication of the 1-inch map in outline will be completed in 1896 in accordance with the programme shown on map No. 3A.

2. Hill features. The area published is 13,756 square miles, of which 800 square miles were published during the year.

According to existing arrangements, the publication of this map will be completed in 1910.

TEMPORARY ADVANCE EDITION OF THE ONE INCH MAP PUBLISHED BY PHOTOZINCOGRAPHY.

The *outline* edition of the 1-inch advance map (see p. 9) has been completed. The area of the advance map with *hill features* published during the year is 408 square miles. The training of the draughtsmen for this particular work has taken a considerable time; but the publication of the sheets will now proceed regularly.

* This area will require modification when the present areas of Lancashire and Yorkshire have been computed from the large scale survey now in progress.

RE-SURVEY OF LANCASHIRE AND YORKSHIRE ON THE $\frac{1}{2500}$ SCALE.

(Area, 8,224 square miles.)

(Vide Map, No. 2.)

During the year plans of the following towns have been published on the $\frac{1}{500}$ scale:—Accrington, Bacup, Beverley, Blackpool, Burnley, Chadderton and Failsworth, Colne, Great Driffield, Horwich, Hull, Knottingley, Lancaster, Lees and Grotton, Lytham, Mossley, Oldham, Ormskirk, Over Darwen, Prescott, Preston, Ramsbottom, Rawtenstall, Richmond, Rochdale, Scarborough, Selby, and St. Helens; and the revision or re-survey of the following towns is in progress:—Ashton-under-Lyne, Blackburn, Haslingden, Ilkley, Middlesbrough, North and South Stockton, Sheffield, Stockport, Whitby, and Withington.

The area surveyed and plotted on the $\frac{1}{2500}$ scale is 7,063 square miles, of which 680 square miles have been surveyed or re-plotted during the year.

The area published on the $\frac{1}{2500}$ scale is 3,286 square miles, of which 1,376 square miles have been published during the year.

The area revised only on the 6-inch scale is 860 square miles, of which 263 square miles have been revised during the year.

The area published on the 6-inch scale is 1,624 square miles, of which 1,101 square miles have been published during the year.

The total area re-surveyed or revised on the two scales is 7,923 square miles and the total area published is 4,910 square miles.

| REVISION.

The survey of *London* on the 5-feet, $\frac{1}{1056}$, scale is being extended and revised, 43,123 acres have been surveyed, of which 18,879 acres were surveyed during the year. The publication of the new plans of London will be commenced in 1893.

The survey of *Plymouth* on the $\frac{1}{500}$ scale is being extended and revised. The publication of the new plans will be commenced in 1893.

It has not been possible, from want of funds, to commence the revision of any of the published $\frac{1}{2500}$ plans.

2. Scotland.

Area, 30,902 square miles.

TOWN SURVEYS.

The plans of all towns entitled to a large scale survey when Scotland was surveyed, have been published. Edinburgh and Dundee have been revised at the cost of the local authorities.

THE CADASTRAL SURVEY ON A SCALE OF $\frac{1}{2500}$.

(Vide Map, No. 4.)

Maps of parishes on the $\frac{1}{2500}$ scale have been published for the cultivated portions of the counties of Aberdeen, Argyll, Ayr, Banff, Berwick, Bute, Caithness, Clackmannan, Dumbarton, Dumfries, Elgin, Forfar, Inverness, Kincardine, Lanark, Linlithgow, Nairn, Orkney Islands, Peebles, Perth, Renfrew, Ross and Cromarty, Roxburgh, Selkirk, Shetland Islands, Stirling, and Sutherland.

The total area published on the $\frac{1}{2500}$ scale is 12,687 square miles.

PUBLICATION OF THE MAP ON A SCALE OF SIX INCHES TO A MILE.

(Vide Map, No. 4.)

The 6-inch maps have been published of the whole of Scotland.

PUBLICATION OF THE MAP ON THE SCALE OF ONE INCH TO A MILE.

(Vide Map, No. 5.)

The whole of Scotland is published on the 1-inch scale in outline, and the area published with hills is 30,342 square miles, of which 1,032 square miles were published during the year.

MAP ON A SCALE OF FOUR MILES TO AN INCH.

An advance edition of the map of Scotland on a scale of four miles to an inch has been published in outline by photozincography.

RE-SURVEY OF THE COUNTIES OF WIGTOWN, KIRKCUDBRIGHT, EDINBURGH, HADDINGTON, AND FIFE AND KINROSS, ALSO THE ISLE OF LEWIS ON THE $\frac{1}{2500}$ SCALE.

(Vide Map, No. 4A.)

The cultivated districts of these counties are being re-surveyed on the $\frac{1}{2500}$ scale; the uncultivated districts are being revised on the 6-inch scale; and the towns are being published on the $\frac{1}{500}$ scale.

During the year 823 square miles have been surveyed and plotted on the $\frac{1}{2500}$ scale, and 42 square miles revised on the 6-inch scale. The publication of the plans will be commenced in 1893.

The survey of *Glasgow* on the $\frac{1}{500}$ scale is being extended and revised.

3. Ireland.

Area, 32,530 square miles.

TOWN SURVEYS.

The revision of Banbridge on the $\frac{1}{500}$ scale, and of Ballymoney, Blackrock, Booters-town, Pembroke, Kingstown, Castlebar, Cork, Cookstown, Larne, Longford, Loughrea, Tuam, and Westport on the $\frac{1}{1056}$ scale is in progress. Plans of Dundalk on the $\frac{1}{500}$ scale, and Roscommon on the $\frac{1}{1056}$ scale have been published. Revised plans of the city of Dublin on the $\frac{1}{1056}$ scale, and of Armagh on the $\frac{1}{500}$ scale are being published.

THE CADASTRAL SURVEY ON THE $\frac{1}{2500}$ SCALE.

(Vide Map, No. 6A.)

County Dublin has been published on the $\frac{1}{2500}$ scale.

The re-survey of Ireland on the $\frac{1}{2500}$ scale is proceeding in Clare, Galway, Kerry, Mayo, and Roscommon, and 3,093 square miles have been surveyed, of which 792 square miles have been surveyed during the year. The area published is 504 square miles, of which 330 square miles were published during the year.

PUBLICATION OF THE MAP ON A SCALE OF SIX INCHES TO A MILE.

(Vide Map, No. 6.)

The whole country has been surveyed, and the plans are published on the scale of six inches to a mile.

Revised maps on the 6-inch scale have been published of the under-mentioned counties:—

Antrim.	Fermanagh.	Meath.
Armagh.	Kildare.	Monaghan.
Carlow.	King's County.	Queen's County.
Cavan.	Leitrim.	Sligo.
Donegal.	Londonderry.	Tyrone.
Down.	Longford.	Westmeath.
Dublin.	Louth.	Wicklow.

These counties contain an area of 15,824 square miles.

The engraving of the revised maps of Galway and Roscommon is in progress.

PUBLICATION OF THE MAP ON A SCALE OF ONE INCH TO A MILE.

(Vide Map, No. 7.)

The whole of this map has been engraved and published in outline, and the plates are being revised as the revision on the larger scales progresses. The area published with hills is 30,010 square miles, of which 860 square miles were published during the year.

MAP ON A SCALE OF FOUR MILES TO AN INCH.

A map of Ireland on the scale of four miles to an inch has been published, and a new edition, which is complete in outline, is in course of preparation.

4. Isle of Man.

Area, 233 square miles.

The *towns* in the Isle of Man have been published on the $\frac{1}{500}$ scale; the *cadastral survey* on the $\frac{1}{2500}$ scale, and the 6-inch map have been completed and published. The 1-inch map has been published in outline and with hill features, as part of the new series 1-inch map of England and Wales.

Tabular Statement of Progress.

SURVEY OF GREAT BRITAIN AND IRELAND.

	England and Wales (including the Isle of Man).		Scotland.		Ireland.	
Area - - -	Square miles. 59,884		Square miles. 30,902		Square miles. 32,530	
Towns, $\frac{1}{500}$, $\frac{1}{1000}$, &c. scales.	Completed.		Completed.		Completed.	
$\frac{1}{2500}$ scale - -	Completed, except the counties of York and Lancaster. See <i>Revision</i> below.		Completed, except the counties of Wigtown, Kirkcudbright, Edinburgh, Haddington, Fife, and Kinross, and the Isle of Lewis. See <i>Revision</i> below.		See <i>Revision</i> below.	
6-inch scale -	Completed.		Completed.		Completed.	
1-inch scale.	During the year 1892.	Total	During the year 1892.	Total	During the year 1892.	Total
Published in outline.	4,708	45,365	Completed.	—	Completed.	—
Engraved.	—	—	—	—	—	—
Published with hill features. Engraved.	800	13,756	1,032	30,342	860	30,010
Advance edition.	Completed.		—		—	
Published in outline.	—		—		—	
Photozincographed.	—		—		—	
Published with hill features. Photozincographed.	408	408	—		—	

RE-SURVEY AND REVISION.

	Lancashire and Yorkshire, area 8,224 square miles.		Scotland.		Ireland.	
$\frac{1}{500}$ scale.	During the year 1892.	Total	During the year 1892.	Total	During the year 1892.	Total
Surveyed and plotted	680	7,063	823	867	792	3,093
Published - -	1,376	3,286	—	—	330	504
6-inch scale.	—		—		—	
Revised - -	263	860	42	42	—	16,553
Published - -	1,101	1,624	—	—	245	16,553

Section III.

Personnel.

Since its commencement the survey has been organised upon a military basis, and carried out under military superintendence. The chief supervision, from the Director-General downwards, has been vested in officers selected from the corps of Royal Engineers. The 13th, 14th, and 16th companies of Royal Engineers were raised for the Ordnance Survey in 1824 and 1825; and the 19th company was added in 1848. These companies have been continuously employed on the Survey to the present time.

The military organisation and supervision have been productive of very great advantage to the service. They have established habits of discipline, punctuality, order, and regularity; have effected a considerable saving of expense, and have materially increased the amount of work produced per man. Various authorities have at different times recorded their opinion in favour of this military organisation and supervision (*see* Annual Report for 1886); and a Departmental Committee reported, 31st March 1892, that any change of the system "would be certain to lead to a large increase in the cost of the Survey without increase of efficiency, but probably, from want of the strict discipline now maintained, the reverse."

A certain number of officers and men of the Royal Engineers are held in readiness for service with an army in the field, to carry out such surveys as may be considered necessary during the progress of a campaign.

In June 1891 the Board of Agriculture appointed a Departmental Committee to inquire into the position of the civil assistants employed on the Ordnance Survey. After a very lengthened and careful investigation the committee reported on the 31st March 1892, and their report was presented to Parliament. They recommended an increase to certain allowances and an extension of certain privileges in regard to travelling allowances, sick pay, leave, &c. To these recommendations the Treasury and the Board of Agriculture have given effect by order and minute.

Section IV.

Methods of Production.

1. *Production of the Manuscript Plan.*—The original detailed survey and manuscript plan are made for towns on the $\frac{1}{3000}$ scale (commonly called the 10-feet scale), and for rural districts on the $\frac{1}{25000}$ scale (known as the 25-inch scale). London, and a few other towns are, however, surveyed and drawn on a scale of five feet to a mile. All $\frac{1}{3000}$, $\frac{1}{10500}$, and $\frac{1}{25000}$ plans in England are now drawn for direct reproduction by photozincography.

2. *Zincography and Photozincography of the $\frac{1}{3000}$ and $\frac{1}{25000}$ Maps.*—New editions of $\frac{1}{3000}$ and $\frac{1}{25000}$ plans drawn prior to 1889 are published by zincography. The manuscript plans are traced in transfer ink on transfer paper; the traces are then laid down on zinc, and impressions printed for sale. With these exceptions photography now serves as the basis for all published maps.

All new $\frac{1}{3000}$ and $\frac{1}{25000}$ plans are now published by photozincography, and the impressions published for sale are therefore *fac-similes* of the original MS. plans. The process is fully described in the Report for 1889.

The Parish and County Index maps that are now being issued are coloured by stencilling.

3. *Production of the 6-inch Plans.*—In South Lancashire and South Yorkshire the revised 6-inch plans are being published by photozincography from the new 25-inch plans. The detail is drawn and the names are typed, in a style suitable to reduction, on

cyanotypes on the 12-inch scale, and from these the 6-inch quarter sheets are directly produced.

In the northern portions of the two counties, where the changes in the artificial features have been slight, the alterations are being carried out on duplicates of the original copper plates.

4. *Production of the 1-inch Map.*—The manuscript map on the scale of one inch to a mile is produced from the 6-inch maps by the aid of photography. The detail that is to appear on the 1-inch map is drawn in black on cyanotypes on the 2-inch scale reduced from the 6-inch map. By this means the details in black only appear on the reduced photograph, and the increased accuracy of the photographic method is secured.

As soon as the engraving of the outline is completed, a copper matrix is taken of the plate, and a duplicate copper-plate made from this matrix by the electrotype process. This duplicate is used for printing the copies which are sold in outline, without the hill features.

The hill features are now engraved on a separate plate in the manner described in the Report for 1889.

For the production of the *advance edition* of the 1-inch map, with hill features, impressions from the engraved plates of the 1-inch map in outline are enlarged by photography to a scale of $1\frac{1}{4}$ inches to a mile. Transfers from the negatives are laid down on zinc and impressions, in very faint blue, are printed on fine drawing paper. On these impressions the hills are drawn in black, and they are then reduced by photography to the 1-inch scale, and transferred to zinc. The hills are afterwards printed in brown over the black outline by double printing.

5. *Machinery.*—A Quad steam zinco-printing machine is being erected with a view of expediting the publication of the smaller plans, and of coping with the increase of work for the War Department.

6. *Workshops.*—There has been no change in the machinery in the workshops.

7. *Electrotyping.*—The fittings in the Electro Department have to a large extent been renewed and improved. Most of the horizontal depositing troughs have been replaced by vertical troughs which occupy less space, and are cleaner and more convenient for working.

The appliances for steeling and nickeling the copper plates have also been improved and extended.

Section V.

Work for other Government Departments.

Surveys for Land Judges Court and Irish Land Commission.—Since 1859, when the first surveys were made for the Landed Estates Court, 4,658 estates, containing 3,451,105 acres, have been surveyed by order of the court at a cost of 144,418*l.* 16*s.* 6*d.* Of this sum 139,118*l.* 3*s.* 9*d.* has been repaid, leaving a balance of 5,300*l.* 12*s.* 9*d.*, which represents expenditure on estates not yet brought to sale. The rules of the Land Judges Court provide for the eventual repayment of all the costs of survey.

The first surveys for the Irish Land Commission were made in 1882, and since that date 81 estates, containing 137,744 acres, have been surveyed at a cost of 2,525*l.* 15*s.* 2*d.* Of this sum 2,524*l.* 16*s.* 0*d.* has been repaid, leaving a balance of 19*s.* 2*d.*, which represents work in hand.

The number of vesting orders and conveyances on which maps have been drawn for transfers of land under the Land Commission has been 16,120, at a cost of 2,301*l.* The work under this head has greatly increased.

Geological Survey.—Provision is made in the Survey Vote for engraving, at the Ordnance Survey Offices, the geological map of the United Kingdom on duplicate plates of the 1-inch map.

Land Registry Office.—The arrangement under which the Ordnance Survey Department has since the 1st January 1889 prepared maps for first registration, and kept an index map of lands registered, has continued to work satisfactorily.

Special Surveys.—The non-commissioned officers and men employed on the Sierra Leone and Gold Coast Boundary Commissions have returned, after completing the work upon which they were engaged. Four non-commissioned officers who were employed under Major Levenson, R.E. on the Anglo-Portuguese Boundary Commission have also returned. The experience gained by the men on these surveys is of great value to the Ordnance Survey Department.

Services for other Government Departments.—Services have been rendered as required during the year to various public offices, including the Admiralty, Board of Trade, Census Office, Colonial Office, General Register Office, Office of Works, Royal Commission on Vaccination, Stationery Office, War Office, and the Chief Secretary's Office, Ireland.

The work for the War Office, including several special surveys, and the copying and printing of a large number of maps, has been exceptionally heavy during the year. The work in connection with the Census has also been very heavy.

Section VI.

Photozincography of Ancient MSS.

The process of photozincography, which was invented at this Office in 1859, besides being used extensively in the preparation of the Ordnance maps, has been applied to the reproduction of a series of fac-similes of the most valuable of the National MSS., by authority of the Treasury.

The following table shows the works that have been published, the cost of production, the sum credited for sales and presentations, and the value of the stock in hand :—

Works Published.	Cost of Production.*	Sales and Presentations.	Gross Value of Stock in Hand.
	£	£	£
Domesday Book - - - -	2,909	3,303	1,700
National MSS. :			
England - - - - -	1,508	3,795	4,128
Scotland - - - - -	817		
Ireland - - - - -	1,956		
Black Letter Prayer Book of 1636 - -	652	640	
Anglo-Saxon Charters - - - -	899	197	
Totals - - - - -	8,741	7,935	5,828

* The cost incurred at Her Majesty's Stationery Office for letter-press printing, paper, and binding is not included.

Section VII.

Sale of Maps.

The maps are sold at the following prices :—

Scale.	Description of Map.	Dimensions.	Price per Sheet.
		in. in.	s. d.
1-inch	England and Wales, old series, full sheets - -	36 × 24	2 6
"	" " " " quarter sheets - -	(about) 18 × 12	1 0
"	" " " " new series - -	18 × 12	1 0
"	Scotland - - - - -	24 × 18	1 9
"	Ireland - - - - -	18 × 12	1 0
6-inch	Great Britain and Ireland, full sheets - -	36 × 24	2 6
"	" " " " partly blank - -	36 × 24	2 0
"	England and Wales, on the new system - -	18 × 12	1 0
25-inch	Great Britain and Ireland - - - -	38 × 25	From 2s. 6d. to 23s.* From 2s. 6d. to 15s.* According to the amount of colouring.
$\frac{1}{300}$	Towns - - - - -	38 × 25	
10-feet	" - - - - -	36 × 24	
5-feet	" - - - - -	36 × 24	

* Uncoloured impressions are supplied at 2s. 6d. of the town plans and the 25-inch plans ; or if areas are shown on the latter, under the system recently adopted, the charge is 3s.

RETURN showing the NET AMOUNT of the SALE of ORDNANCE MAPS and BOOKS, including the value of those supplied to Public Departments, Public Institutions, Public Libraries, Government Educational Establishments, Foreign Governments, and under the Provisions of the Copyright Act, by the Ordnance Survey, and by Her Majesty's Stationery Office, between the 1st January and 31st December 1892.

				Sales and Presentations by			Total.
				The Ordnance Survey.		H.M. Stationery Office.	
England	One-inch scale	-	-	-	£ 391 0 6	£ 1,875 18 7	£ 2,266 19 1
	Surrey, &c. hills, six-inch scale	-	-	-	40 8 3	3 18 9	44 7 0
	Six-inch scale	-	-	-	532 10 3½	2,308 7 11	2,840 18 2½
	$\frac{1}{2500}$ scale with area books	-	-	-	721 8 3	4,719 10 8	5,440 18 11
	Town maps on various scales	-	-	-	948 17 2	2,037 11 6	2,986 8 8
	Jerusalem and Sinai surveys	-	-	-	62 17 4½	12 17 6	75 14 10½
	Sundry maps and books	-	-	-	3,940 7 9	244 5 5½	4,184 13 2½
Total, including 6,325 <i>l.</i> 10 <i>s.</i> 7¼ <i>d.</i> to Public Departments, Institutions, &c., and under the provisions of the Copyright Act				6,637 9 7	11,202 10 4¼	17,839 19 11¼	
Scotland	One-inch scale	-	-	-	83 19 3	270 15 11¼	354 15 2¼
	Six-inch scale	-	-	-	54 7 3	317 14 11¼	372 2 2½
	$\frac{1}{2500}$ scale with area books	-	-	-	12 5 3	277 17 10½	290 3 1½
	Town maps on various scales	-	-	-	—	61 19 4	61 19 4
	Total, including 159 <i>l.</i> 16 <i>s.</i> 8¼ <i>d.</i> to Public Departments, Institutions, &c., and under the provisions of the Copyright Act				150 11 9	928 8 1¼	1,078 19 10¼
Ireland	One-inch scale	-	-	-	67 6 3	145 11 10	212 18 1
	Six-inch scale	-	-	-	616 13 0	801 4 6½	1,417 17 6½
	$\frac{1}{2500}$ scale with area books	-	-	-	62 14 9	49 14 6½	112 9 3½
	Town maps on various scales	-	-	-	47 0 6	122 9 4	169 9 10
	Total, including 901 <i>l.</i> 8 <i>s.</i> 6 <i>d.</i> , to Public Departments, Institutions, &c., and under the provisions of the Copyright Act				793 14 6	1,119 0 3	1,912 14 9
Total net amount				7,581 15 10	13,249 18 8½	20,831 14 6½	

ABSTRACT.

Sold by				£	s.	d.	£	s.	d.
The Ordnance Survey				440	4	7½	13,444	18	8½
Her Majesty's Stationery Office				13,004	14	1			
							£	s.	d.
Presentations.	Ordnance Survey Office.	Copyright Act	-	-	-	1,584	6	1½	
		Public Departments	-	-	-	5,353	2	11	
		Public Institutions	-	-	-	5	0	9¾	
		Public Libraries	-	-	-	23	17	8¼	
		Government Educational Establishments	-	-	-	104	14	4½	
		Foreign Governments	-	-	-	70	9	3½	
	Her Majesty's Stationery Office.	Public Departments	-	-	-	239	1	3	
		Public Libraries	-	-	-	6	3	4½	
							7,386 15 10		
Total net amount				- £20,831 14 6½					

Ordnance Survey maps are now sold by Mr. Stanford, Messrs. Menzies & Co., and Messrs. Hodges, Figgis, & Co., who are respectively the sole agents for England, Scotland, and Ireland. The conditions under which the maps are sold by the agents will be found in Section XI. of the Annual Report for 1889. Mr. Stanford has at the instance of the Board of Agriculture undertaken to establish 125 sub-agents throughout England and Wales, and to keep a stock of uncoloured maps and plans for sale. Copies of the map catalogue, index maps, and specimen maps on all scales, are being supplied gratis to Mr. Stanford for distribution to his sub-agents.

Mr. Stanford received on 1st January 1885 maps to the gross value of 25,692*l.*, and this amount had increased on 31st December 1892 to a stock in hand of the value of 40,515*l.* The agent in Scotland received on 1st February 1887 maps to the gross value of 7,124*l.*, and the value of the stock in his hands on 31st December 1892, was 8,929*l.* The agent in Ireland draws his supplies from the stock at the Ordnance Survey Office in the Phoenix Park.

Until the last two years, which show a slight decrease, there has been a gradual increase in the total net value of the maps sold. The amount for 1886 was 9,462*l.* 5*s.* 6 $\frac{3}{4}$ *d.*, for 1887, 11,063*l.* 2*s.* 3 $\frac{1}{4}$ *d.*, for 1888, 12,573*l.* 2*s.* 0 $\frac{1}{4}$ *d.*, for 1889, 13,146*l.* 16*s.* 4 $\frac{3}{4}$ *d.*, for 1890, 13,763*l.* 19*s.* 5*d.*, for 1891, 13,635*l.* 0*s.* 1 $\frac{3}{4}$ *d.*, and for 1892, 13,444*l.* 18*s.* 8 $\frac{1}{2}$ *d.*

The sales have not been in proportion to the very great increase in the number of maps published.

Section VIII.

Utilisation of the Ordnance Survey Maps.

Land Transfer.—The new rules for the Land Registry Office, issued on the 1st January 1889, provide that “all maps furnished for registration shall be, or shall be “prepared from, sheets of the Ordnance map on the largest scale extant for the “locality.” Maps for first registration have since that date been prepared by the Ordnance Survey Department, and an index map of all lands registered has been made.

Boundaries and Areas.—In Ireland the boundaries and areas of territorial divisions as ascertained by the Ordnance Survey are the legal boundaries and areas of those divisions. And the Valuation Acts provide that the Ordnance Survey maps are to be used in ascertaining the areas of tenements.

In Great Britain the boundaries shown on the Ordnance Survey maps have no legal recognition, though, in compliance with the terms of the Survey Act (4 & 5 Vict. c. 30.) the boundaries of all parishes, &c. have been ascertained at great cost by local investigation and perambulation.

In Great Britain the Ordnance Survey maps are rarely used as the basis of valuation for local assessment. The valuation list directed to be made by overseers of parishes, under 25 & 26 Vict. c. 103. s. 14, does not refer to the Ordnance Survey maps, and contains only a column headed “estimated extent.” Greater accuracy would be secured if it were made compulsory to give the situation of the tenement on the Ordnance Survey plans, and the area as ascertained by the Ordnance Survey, as is now done in Ireland.

Section IX.

RETURN of SUMS expended for and received from the LAND JUDGES COURT, IRELAND, in the
Year ending 31st December 1892.

1892.	Expended (including Regimental Pay).	Received.
	<i>£ s. d.</i>	<i>£ s. d.</i>
March Quarter	946 3 6	1,238 7 10
June „	897 16 3	568 17 5
September „	789 6 2	749 4 9
December „	840 18 2	845 5 7
Total	3,474 4 1	3,401 15 7

N.B.— The cost of the surveys is repaid out of the sales of the properties, &c., but considerable difficulty has been experienced in recovering the money expended on these surveys.

Section X.

Distribution of the Officers and Divisions.

HEAD-QUARTERS, SOUTHAMPTON.

Lieut.-Colonel John Farquharson, C.B., is the Executive Officer of the Survey. He has charge of the correspondence and accounts, and carries on, under the orders of the Director, the general administrative duties of the Department.

Captain C. E. Haynes is assistant to Lieut.-Colonel Farquharson, and has charge of the issue of the maps.

Major D. A. Johnston, assisted by Lieutenant H. M. St. A. Wade, is in charge of the examination of all MSS. plans, their reduction to smaller scales by photography, the tracing of plans for zincography, and of the photozincographing, zincographic printing, and letter-press printing departments.

Major D. A. Johnston has also charge of the trigonometrical branch of the work.

Major C. R. Conder is in charge of the preparation of the 1-inch map for engraving, the engraving of the maps of Great Britain, the copper-plate printing, and the colouring of maps.

Captain C. Hill, assisted by Quarter-master Kenny, is in charge of the stores and workshops, and of the electrotyping of duplicates of copper-plates.

The various Divisions of the Survey will be occupied during the year 1893 in carrying on the Revisional Survey in the districts named below :—

	Station.	Districts.
Captain Ruck	York	East Edinburghshire, Haddingtonshire, and Fifeshire and Kinross-shire.
Captain Russell	Redhill	North-east Yorkshire and South-east London.
Captain Norton	Derby	South Yorkshire and North-west London.
Captain Oldfield	Carlisle	North Lancashire, Wigtownshire, and Glasgow.
Captain Leahy	Edinburgh	North-west Yorkshire and West Edinburghshire.
Captain Salvesen	Clifton	South-west London and Plymouth.
Captain Mould	Chester	South-west Lancashire and Kirkcudbrightshire.
Captain Buckland	Bedford	South-east Lancashire, West Yorkshire, and North-east London.
Captain King, assisted by Captain Broke	Clifton	Re-levelling in Great Britain and Ireland, completing the hill sketching in England and contouring in Ireland.

IRELAND.

Dublin.—Lieut.-Col. Kirkwood, assisted by Captain Shaw and Captain Pery, has charge, at the office in the Phoenix Park, of revision surveys in North Galway, Mayo, Roscommon, and various towns, with the engraving and publication of all the maps, and the surveys for the Land Judges Court and Land Commission.

Captain Paske is stationed at Ennis, for the survey of Clare and South Galway.

Captain Brooker is stationed at Cork, for the survey of Kerry.

Section XI.

Statement of the Force employed on the Ordnance Survey on 31st December 1892.

Royal Engineers	Officers	24
	Warrant Officers	2
	Non-Commissioned Officers and men	352
Civil Assistants		1,637
Labourers		422

Section XII.

Statement showing the Sums provided in the Estimates and Expended during the 10 Years ending 31st March 1892.

Year.	Pay and Extra Pay, &c. of Staff.		Extra Pay, &c. of Non-commissioned Officers, &c.		Pay, &c. of Civil Assistants, &c.		Travelling.		Fuel, &c.		Stores.		Contingencies.		Miscellaneous.		Total.	
	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.	Estimate.	Expenditure.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
1882-3	10,093	9,716	17,500	16,606	167,307	158,736	3,300	3,791	1,500	1,637	10,800	10,543	4,500	5,468	Plans prepared by Civil Surveyors.		215,000	206,667
1883-4	9,563	9,714	17,500	16,769	190,637	178,114	4,700	4,904	1,550	1,779	12,850	12,016	5,700	5,890	—	175	242,500	229,413
1884-5	9,967	9,470	17,800	17,411	196,243	196,347	5,350	5,065	1,700	2,019	11,000	11,298	6,450	5,812	Loss by Fraud.		247,500	247,433
1885-6	9,938	8,731	17,800	17,541	208,514	200,593	5,000	5,061	1,850	1,872	11,000	11,134	6,400	5,505	—	23	260,500	250,437
1886-7	9,936	10,283	18,100	17,913	208,264	198,863	4,900	5,730	2,100	2,345	9,000	9,123	5,700	5,136	—	—	258,000	249,393
1887-8	9,631	9,988	18,100	15,423	166,369	165,417	4,100	5,669	2,100	2,043	9,200	8,309	5,000	4,457	Revision of Survey of Great Britain.		230,000	229,825
1888-9	8,988	8,759	17,800	15,615	175,282	173,263	6,380	5,406	2,600	2,143	7,000	7,634	5,000	4,099	15,500	18,529	223,000	222,209
1889-90	8,868	8,022	17,800	15,275	167,842	173,481	6,000	4,469	3,000	2,176	7,000	7,039	4,500	3,788	—	—	215,000	214,240
1890-1	8,205	7,865	18,664	14,436	171,791	171,036	5,240	4,597	2,400	2,402	5,300	5,895	4,400	4,010	—	—	216,000	210,341
1891-2	7,821	7,806	17,000	14,889	174,779	176,489	4,500	4,939	2,400	2,290	5,070	5,064	4,200	4,277	—	—	215,770	215,754

Ordnance Survey Office,
Southampton, 23rd February 1893.

C. W. WILSON, Major-General,
Director-General.

STILLER, W. DEWEY GILSON, J. AND J. H. A. D. S. H. D. A. / NO. 100

(b) the Scales of 2.5 Inches and 6 Inches to a Mile

showing the state on the

2011-11-11

continued in the school

Reference

Published on 51 inch scale

Do. (inch. scale; engraved)

I_{H_2} 6" (photozinc)

Do 25 and 6" improved

De 2.5" and 6" photovisors)

Notes. Yorkshire and Lancashire were published on the Six-inch scale before the 25 inch scale was adopted, see Index A72.

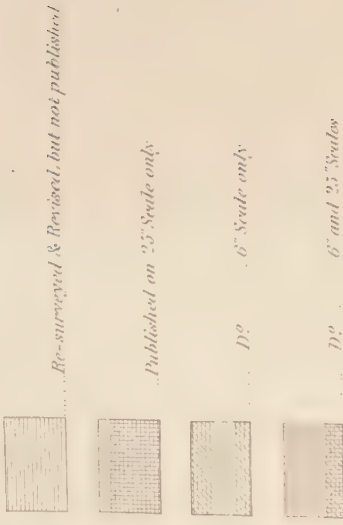
The small portions of adjacent counties not published on a larger scale than Six inches to a mile are unshaded.

The coast line is that of High Water.

The short lines and numbers in this Index are those of the One Inch Map, new series.

Grade 30 Miles to One Inch

Reference



Notes: Yorkshire and Lancashire were published on the 25 inch scale before the 6 inch scale was adopted. North of the 6" upper plateau being revised. South of the 6" upper plateau being revised by photogrammetry. The revised line is that of High Water.



The sheet lines and numbers on this index are those of the One Inch Map new series.

FORECAST OF PUBLICATION OF 1" MAP

No 34

1 N O G X

to the

ORDNANCE SURVEY OF ENGLAND AND WALES

On the Scale of One Inch to a Mile

N 10 11 12 13 14 15

Reference

Published 31 12 1892

Will be published 1893

1894

1895 1896

Note: The coast line is that of High Water



Scale: 1" = 1 Mile

157

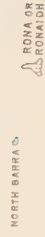
to the

Number of hauls	<i>P. setiferus</i> (%)	<i>P. setiferus</i> + <i>P. setiferus</i> + <i>P. setiferus</i> (%)
1	10	5
2	30	10
3	50	15
4	70	18
5	85	20
6	90	22
7	95	23
8	98	24
9	99	25
10	100	26

100

*The above-named High School Institute
not published on the 25th July Series.*

The coast line is that of High Water.



Scale of this Index 30 Miles to an Inch

No 4A

INDEX

to the

ORDNANCE SURVEY OF SCOTLAND

On the Scales of 25 and 6 Inches to a Mile

Showing the state of the revision
on the31st December 1892

Reference

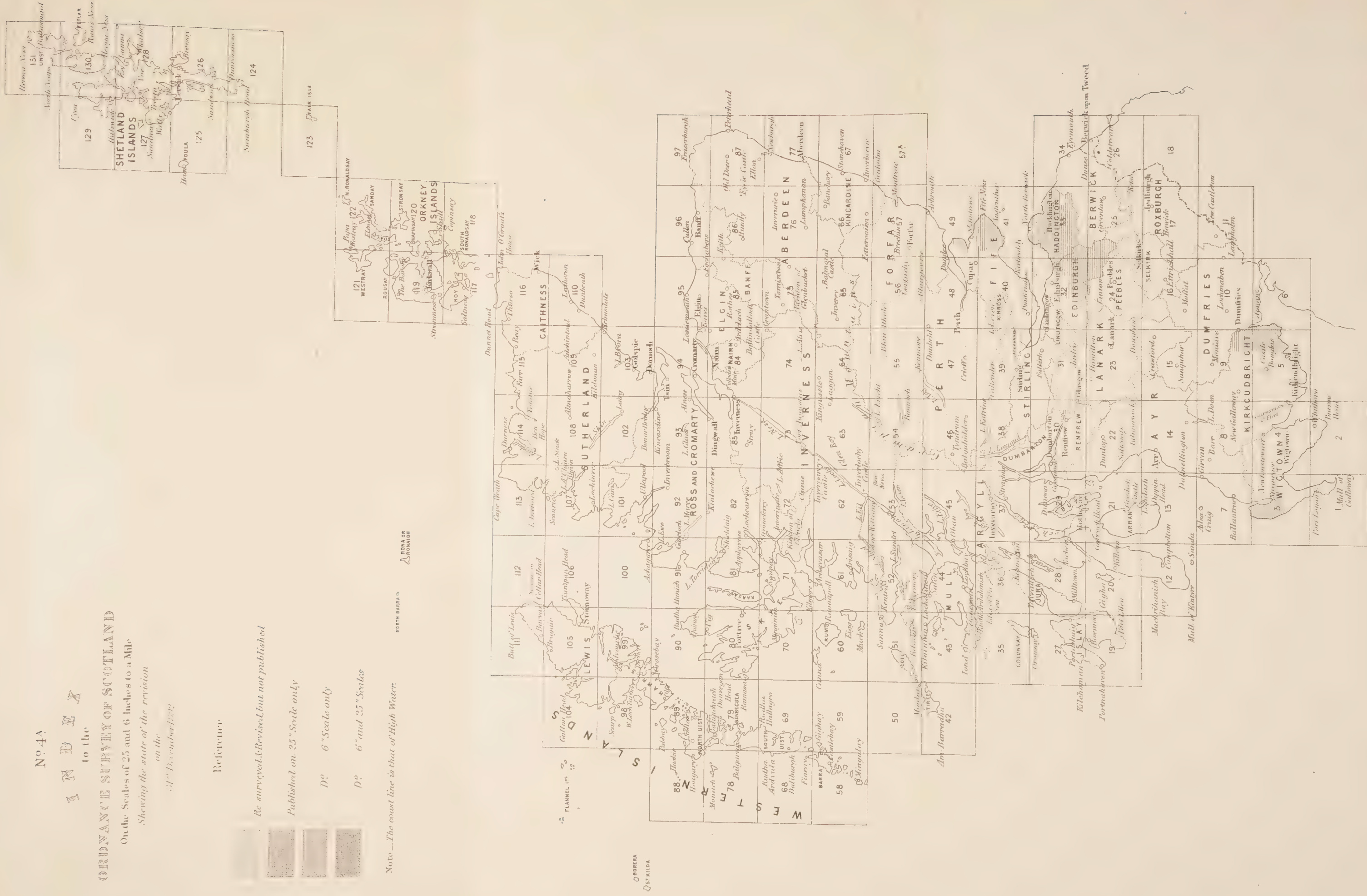
Re surveyed & Revised, but not published

Published on 25" Scale only

Do 6" Scale only

Do 6" and 25" Scales

Note.—The coast line is that of High Water.



Scale of this Index 30 Miles to an Inch.

0 5 10 20 30 40 50 60 70 80 90 100 Miles

No. 5 **INDEX** to the **ORDNANCE SURVEY OF SCOTLAND**

On the Scale of One Inch to a Mile

Showing the state on the

31st December 1892

Reference



Published in Outline with Contours



Do and
Published with Tides

Notes. The Map is published separately in each of the above forms.

The coast line is that of High Water.



123 FAIR ISLE



NORTH BARRA
 A BONA OF MORAYSH
 Published on Sheet 115



Scale of this Index: 30 Miles to an Inch

REVISION OF THE SURVEY

No 6
A N D E X
to the
ORDNANCE MAP OF IRELAND

Published on a Scale of Six Inches to a Mile.

Showing the progress of the Revision to the

31st December 1897.

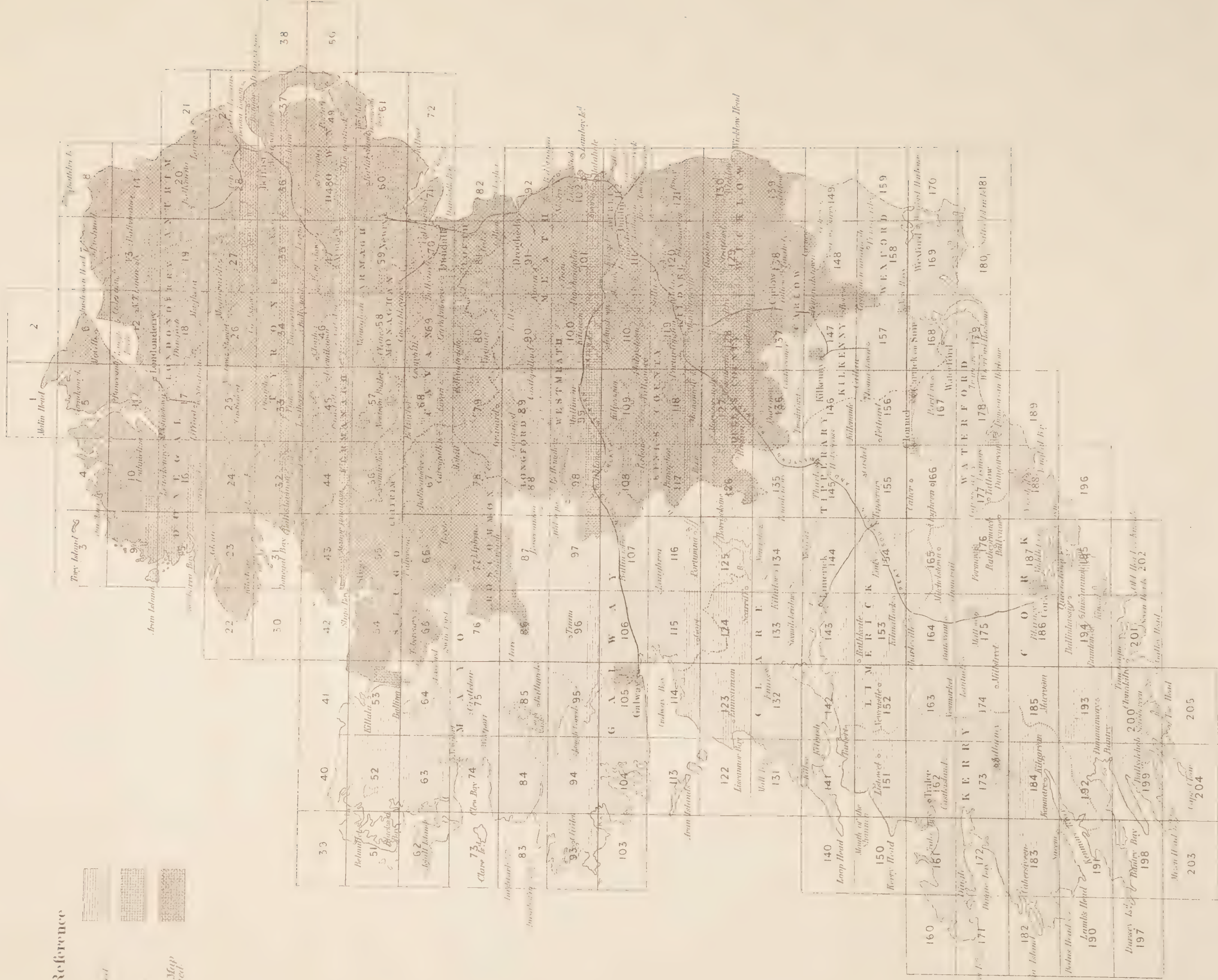
Reference



Published

Revised

Revised Map published



REVISION OF THE SURVEY

Nº 6A

to the

ORDNANCE MAP OF IRELAND

Published on a Scale of 25 Inches to a Mile

Showing the state on the

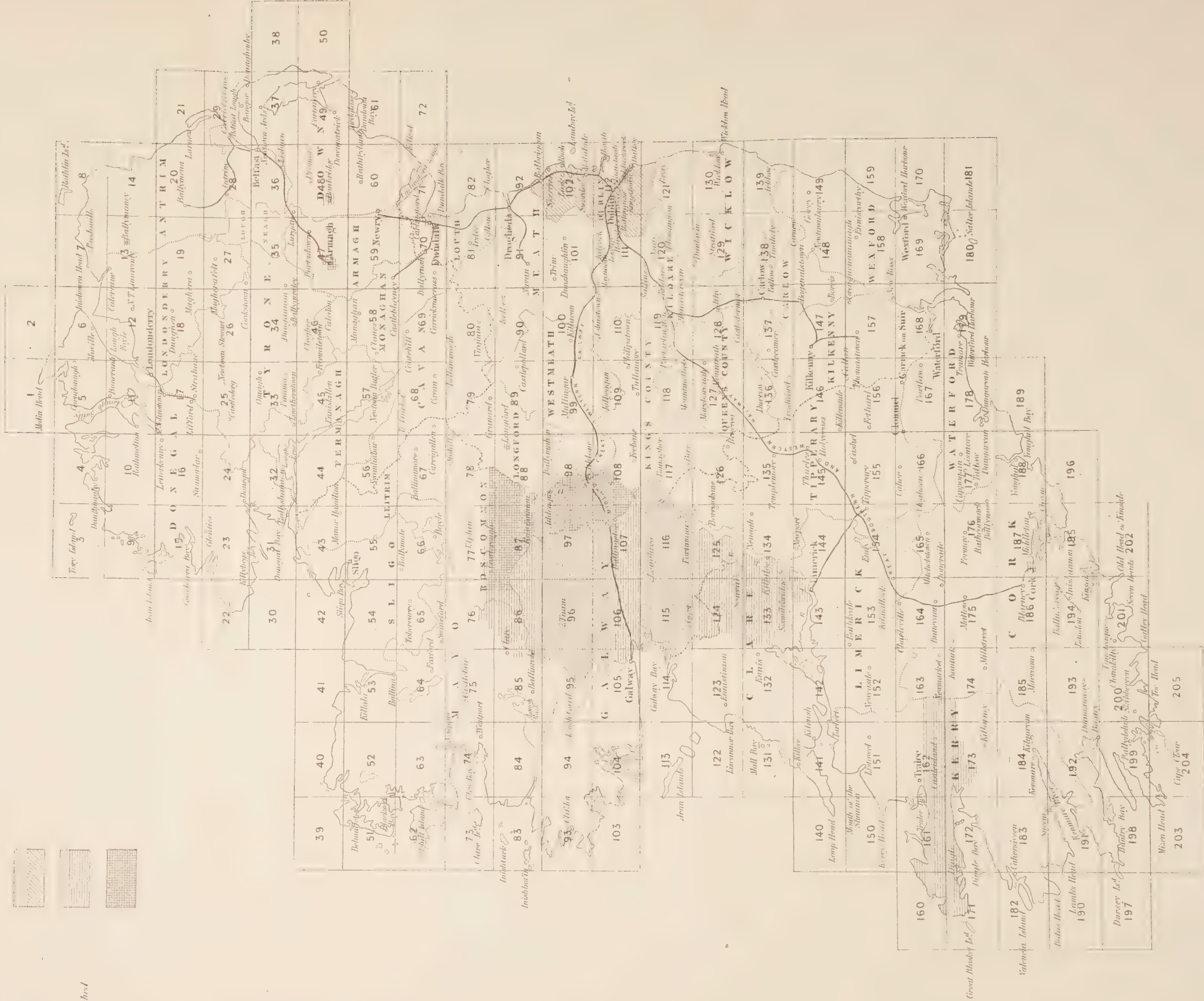
31st December 1892

Reference

Previously published on 25 inch scale

Re-surveyed or re-plotted but not published

Published



Scale 25 Miles to One Inch

10 20 30 40 50 60 70 80 90 100

No. 7 INDEX to the ORDNANCE MAP OF IRELAND

Published on a Scale of One Inch to a Mile

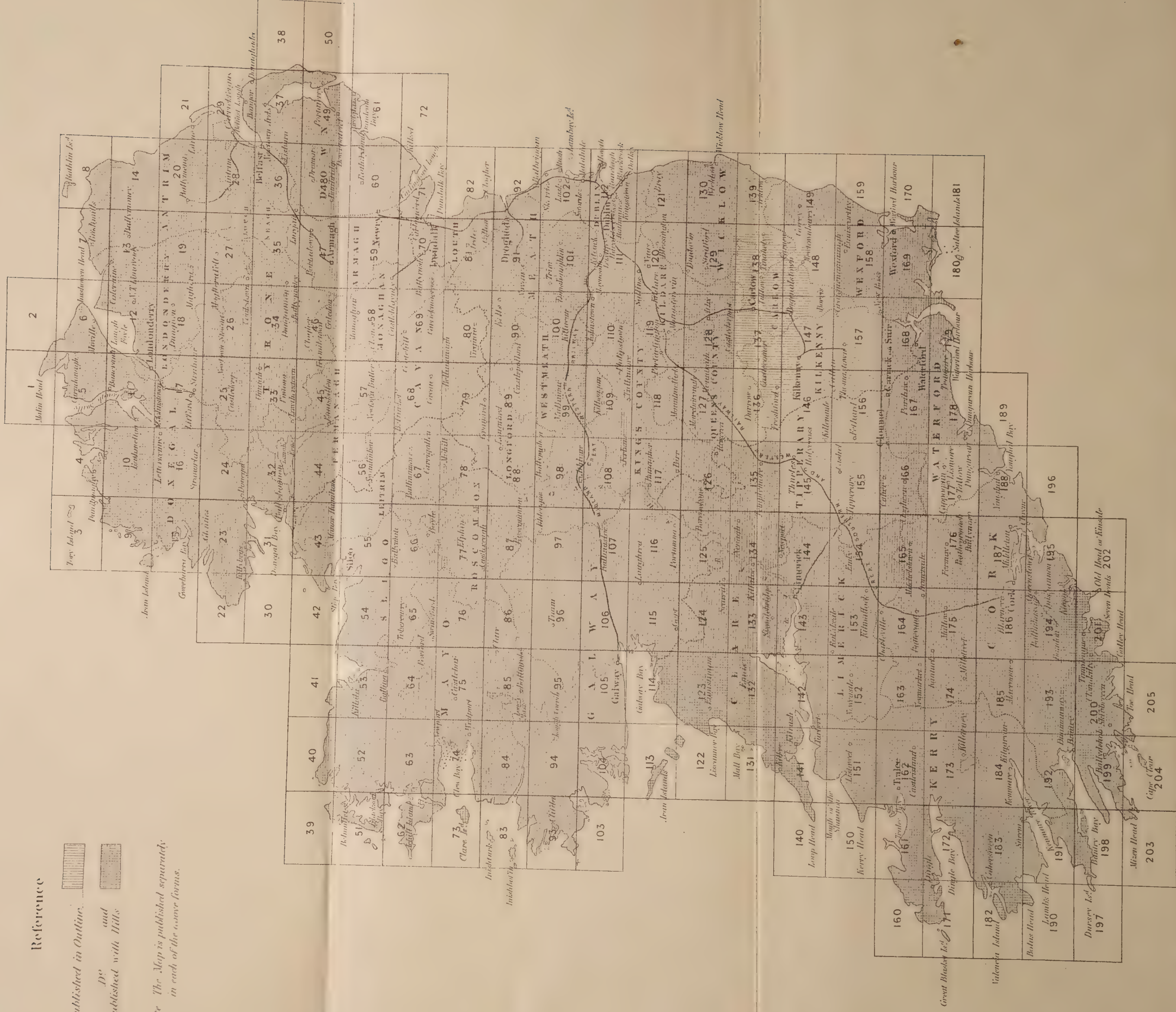
Shewing the progress to

31st December 1892

Reference

Published in Outline.
Do and
Published with Hills

Note The Map is published separately
in each of the above forms.



Scale 1" = 1 mile to One Inch
10 20 30 40 50 60 70 80 90 100

